

Engineering  
Library

# AUTOMOTIVE INDUSTRIES

LAND — AIR — WATER



LIBRARY

29 W. 39 St., N. Y. C.

JANUARY 1, 1940

## Creative Engineering



**New Departure's Famous "Firsts" include:**

- first coaster brake
- first yellow taxicab
- first monobloc engine
- first dual purpose ball bearing
- first self-sealed bearing
- first preloaded bearing

**NEW DEPARTURE**  
**THE FORGED STEEL BEARING**

# ***OPERATORS AND TOOLS TAKE ON NEW LIFE***

● SHOP-MIXED cutting lubricants may be necessary on rare occasions, but everyone in an Illinois machine tool plant drew a deep breath of relief when a mixture of an odorous animal fat and paraffine oil was replaced by Acme Cutting Oil on automatic machines.

Odor elimination wasn't the only benefit. It was soon evident that tools lasted longer. Acme not only cost less

than the mixed oil, but it eliminated the troublesome mixing job.

Don't mix another batch of cutting oil until you have seen your Standard Lubrication Engineer and tested the cutting oil he recommends. His service will cost you nothing. Just call the local Standard Oil (Indiana) office, or write 910 South Michigan Avenue, Chicago, Illinois.

Copyr. 1946, Standard Oil Co. (Ind.)



**ACME**  
**CUTTING OIL**

**STANDARD OIL COMPANY (INDIANA)**

LUBRICATION ENGINEERING

# IN THIS ISSUE . . .

## AUTOMOTIVE INDUSTRIES

Reg. U. S. Pat. Off.  
Volume 82 Jan. 1, 1940 Number 1

### With Powder

As in other things there are specialties among those who work with powder metallurgy. One prominent organization devotes all of its energies to porous metallic structures. And out of this have come some remarkable new products. Here, for example, is a porous copper alloy filter element, almost transparent and yet composed of myriads of tortuous passages. When formed like a cork, it serves as a filter in Diesel fuel injectors, removing all physical impurities, including any particles that have a large length to diameter ratio. When used in disk form, the filter seems a natural for fuel pumps. Most amazing is the use of porous powder metallurgy technique in the production of oil pump gears. They weigh less, cost less, have a finer finish than can be produced by expensive machining.

### Balanced Sets

Recent S.A.E. meeting discussion in Cleveland placed emphasis upon the need for accurately balanced tires—balanced in matched sets of casing and tube. According to one tire engineer, there is already talk of carrying this principle through to the replacement business, thus assuring good balance even on a car with considerable mileage.

### Uniform Flow

We understand that a certain important parts maker is in production on a new type of aircraft fuel pump promising many important advantages. The pump is of vane type and its unique feature is that it is capable of producing uniform flow.

See page 25 for other items of particular interest to production men.

*Automotive Industries*

### GENERAL

#### Labor's Major Error in Minority Leadership

1

When organized labor speaks, our politicians like to make themselves and the public believe that they are listening to the voice of labor. But organized labor is a minority. From that point on reading this article by Julian Chase will develop a line of thought that may have evaded you.

### PRODUCTION

#### Packard has New Arrangement for 1940 Production

4

A whole new layout and procedure has come out of the new plans at Packard for their '40 production line. The inception of the new plans is four years old. New things are being done and old things in a new way that Joseph Geschelin tells about with thoroughness.

### NEW DEVELOPMENTS

#### Men and Machines

18

Things look bright in the machine tool field with plant additions and orders on the books. There are some new developments of particular interest to men on production. This is a regular feature designed to keep you up to the minute.

### GAS GENERATORS

#### Gas Generators Capture European Interest

22

With the soaring price of gasoline and the drains of war on the supply, more and more interest is being manifested in gas generators. Here is the detailed description of a typical model with a bibliography on the subject for those who want to read up on it.

#### Business in Brief

#### Production Lines

#### Just Among Ourselves

#### Engineering Drawings

#### News of the Industry

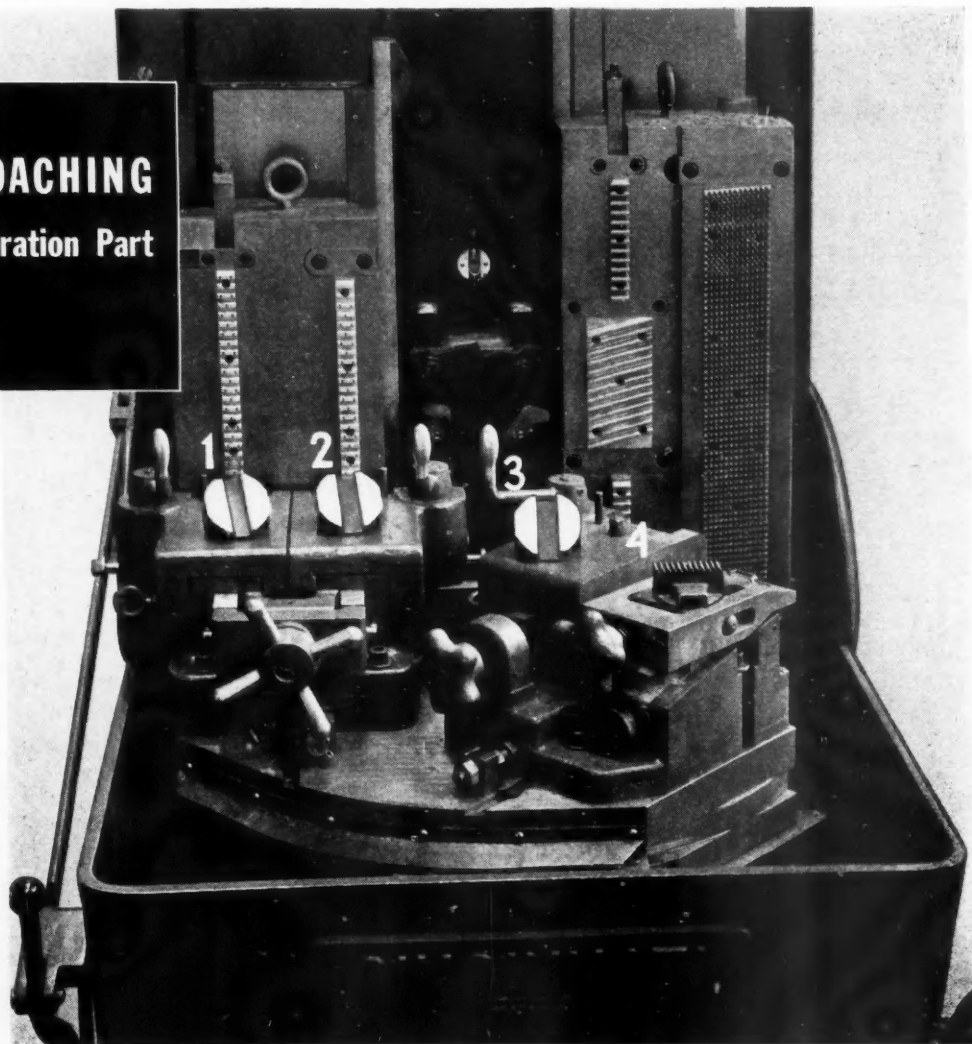
Since 1913 all issues of AUTOMOTIVE INDUSTRIES have been indexed in the *Industrial Arts Index*, which can be consulted in any public library.

January 1, 1940



## PROGRESSIVE BROACHING

Completes One Three-operation Part  
Each Cycle

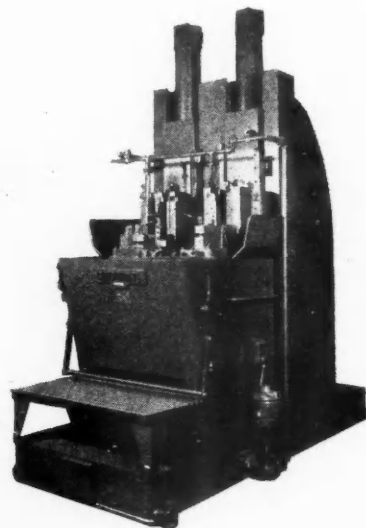


● Here's a broaching job that rings the bell in low cost production and minimum floor space requirements. Progressive broaching—transferring the part from one station to the next for each succeeding operation—does the trick.

Four of the parts, "rack and slot" for washing machines, are displayed on the fixtures mounted on the table of a CINCINNATI No. 5-54 Duplex Hydro-Broach. Four stations are required for the three operations, which consist of finishing the face, the sides and bottom of the slot, and broaching the rack teeth from the solid. In station No. 1, the face is rough broached and the slot is started. Station No. 2—slot is completely roughed out. Station No. 3—slot is finished to size and depth, and face is finished. Station No. 4—rack teeth are broached to form and height.

For each machine cycle, a finished part is removed from station No. 4, at a production rate which averages 153 parts an hour.

CINCINNATI Duplex Hydro-Broach Machines, with their exclusive swivel table, are particularly suitable for progressive broaching operations. Circular M-842 lists all the features of these machines. Write for a copy.



# THE CINCINNATI MILLING MACHINE CO.

Cincinnati, Ohio, U. S. A.



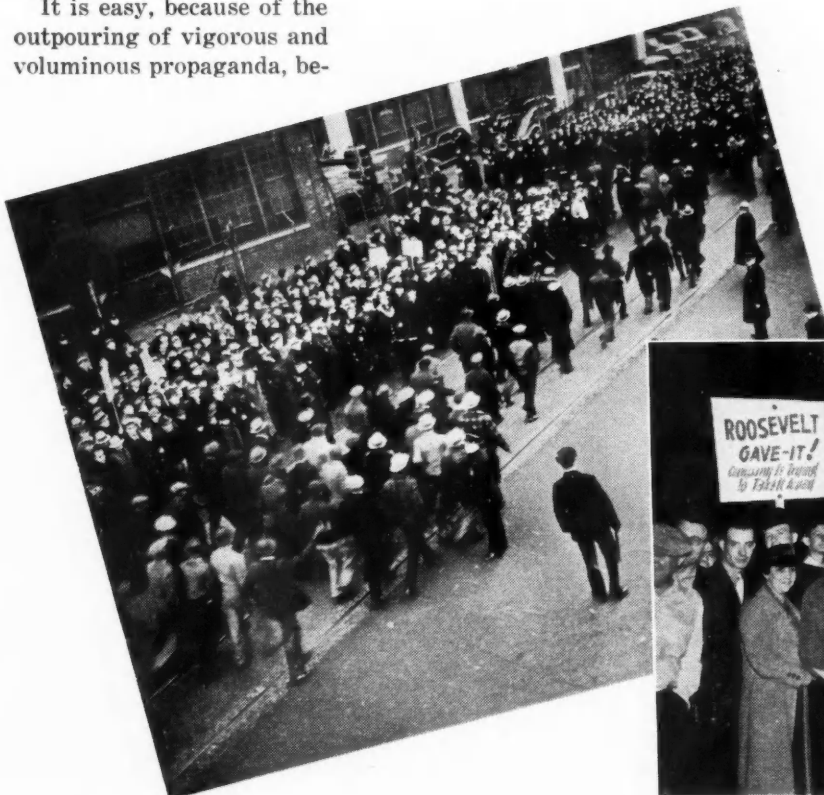
## Labor's Major Error in Minority Leadership

**C**ONSPICUOUSLY grouped in the front rank of those who stand as protectors of minority rights, we should see our labor union leaders. We should see them militantly arrayed as massed defenders of the few against oppression by the many. We can naturally expect of them, as professed and accepted believers in the American ideal, a recognition of the essentialness of safeguarding minority rights for the preservation of democracy. We might also reasonably expect of them, as practical men who have a selfish as well as an altruistic interest in their special cause, at least a guarded awareness of the fact that in championing these rights in a broad way they are upholding their own in a narrower way, for they themselves are minority leaders.

It is easy, because of the outpouring of vigorous and voluminous propaganda, be-

cause, too often, the fewness of numbers is hidden behind a smoke-screen of bombast and political arrogance, to overlook the fact that organized labor is a minority. But it is a minority. It is an important and potent minority. It is one of our many minority pressure groups. And like all such groups, the disproportionate power which it wields comes partly through the strength of its organization but more through the weakness of our politicians. When organized labor speaks, our politicians like to make themselves and the people generally believe that they are listening to the voice of Labor. But organized labor is not Labor. It is a relatively small, dues-paying part of Labor which is held together and led by extremely articulate men in the higher income brackets who

have incidentally made big business out of their leadership and among whom are some who seek now, through immunity and protection provided by law, to ac-



*We had strikes before we had  
the National Labor Relations  
Act but we have had more  
since and more bitterness in  
labor relations*



quire monopolistic control over the jobs which industry provides and over the right of the worker to work.

Labor, the entire laboring portion of our population, which *should* have the politician's better hearing ear, for whose protection our labor laws *should* be drawn and about which our Government's guarding arm *should* be extended, is almost all of us—the 46 million gainfully employed and their many millions of dependents. Parenthetically, it can be said that only in glowing but empty words of political leaders and in largely contravened clauses of our Constitution have the rights and the well-being of this large mass of our citizens, in late years, been given more than scanty consideration.

Minority leaders as they are, our labor union heads have given little evidence of being concerned with the rights of minorities except when, in competitive situations, they find themselves and their special interests in obvious and embarrassing minorities. At other times they stand boldly, but not wisely, for the closed shop, for the exclusive right of majorities to bargain collectively, for the check-off, for production control, for seniority against fitness, for restriction of apprentice training, for these and other monopolistic, restrictive, regimenting practices which, pursued to their logical and almost inevitable ends, would result in the complete suppression of minorities including, tragically, their own. And they ask, expect and have lately been getting governmental aid in this expeditious method of



*The Wagner Act, designed as a club, looks more and more like a boomerang.*

such a rebound are today still multiplying. Congress has sensed and been moved by a marked change in public sentiment toward legally regulated labor relations. A House Committee is at work investigating the

committing political suicide.

Possibly the greatest tactical mistake that our labor leaders ever made was to lend their advocacy and support to the passage of the National Labor Relations Act. It was a reactive and reactionary error. When the Act was shaped, it might have been mistaken for a caveman's club but it seems more and more, as days and months go by, to be a boomerang which, if its hurlers do not quickly duck, may smite them with its business end.

From such drastic, lopsided, uneconomic, suppressive and collusive legislation, a rebound was and is inevitable. Evidences of

such a rebound are today still multiplying. Congress has sensed and been moved by a marked change in public sentiment toward legally regulated labor relations. A House Committee is at work investigating the conduct of the Labor Board. It is looking into the effects of the Act in stilling or stirring labor strife and, among other things, into the desirability of further elucidation of the meaning of "interstate commerce," and that's immediately important. Several states have recently passed new two-way labor laws which tell both sides what they can and cannot do, which consider coercion to be coercion from whatever source it comes. One state has adopted a law calling for the licensing of labor organizations.

Growing rapidly is a demand that labor unions, into whose treasuries millions on millions of workers' money flow each year, be compelled to disclose how this money is raised and, more particularly, how it is spent and what it (Turn to page ???)

## The Brass-Hat Rack



"But Mr. Whiffle, you insisted there be plenty of leg room!"

# BUSINESS IN BRIEF

*Our own view of automotive production and sales;  
authoritative interpretation of general conditions*

**P**RODUCTION of cars and trucks reached its 1939 peak during the week ending Dec. 23 with all major producers operating at capacity or close to capacity rates and with most independents also holding up their output near top levels. A check of factory schedules indicates a volume of approximately 115,000 vehicles for that week.<sup>3</sup>

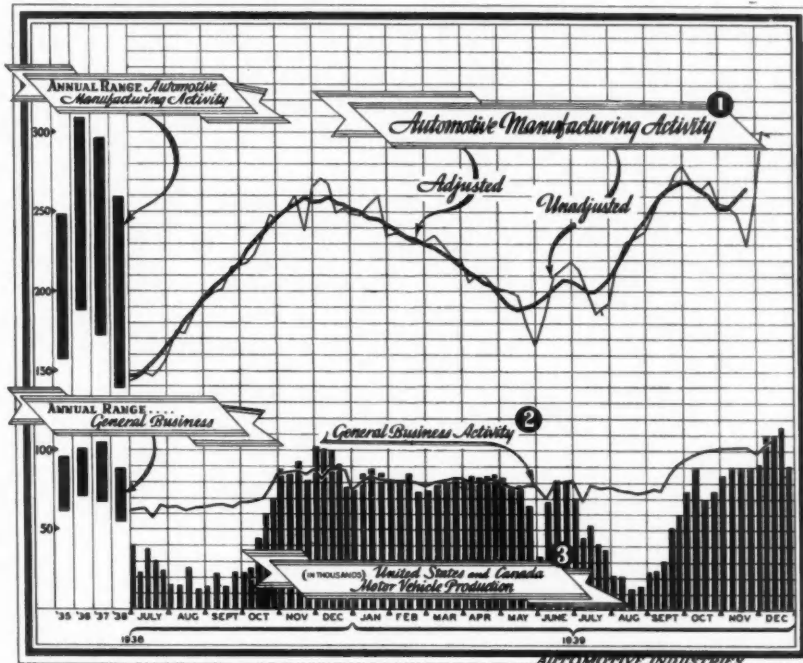
Most plants expected to maintain approximately the same daily rate during the last week in December but because of the Christmas holiday would be losing one day's production. As a result, output for the last week in the year was expected to be around 91,000 cars and trucks.

On the basis of these estimates, December car and truck production will total approximately 450,000 units, a gain of 43,000 over December, 1938, and the largest monthly output since July, 1937.

A preliminary estimate of total car and truck production for the 1939 calendar year, based on official U. S. Department of Commerce figures for the first 10 months and estimates for November and December, places the industry's output at approximately 3,718,000 units. This represents a gain of 1,063,000 or 40 per cent over 1938 production of 2,655,000 cars and trucks.

Production for the last quarter of 1939, which roughly constitutes the first quarter of the 1940 model season, easily passed the one million mark, the actual estimated total for the three months being 1,148,000 cars and trucks. This corresponds with 1,012,000 cars and trucks turned out in the last three months of

<sup>1</sup> 1923 average = 100; <sup>2</sup> Prepared by Administrative and Research Corp., New York. 1926 = 100; <sup>3</sup> Estimated by J. A. Laansma, Detroit News Editor, AUTOMOTIVE INDUSTRIES.



**Weekly indexes of automotive general business  
charted**

## December Reached Year's Peak

rent levels for most manufacturers during January. As a matter of fact, barring unforeseen developments, production is expected to continue at a healthy pace during the winter months and during the latter part of winter is expected to feel the influence of anticipated spring selling.

Of current weekly production, General Motors divisions have been accounting for approximately 47,000 units, followed by Ford divisions with around 25,000, and Chrysler divisions with close to 24,000. Studebaker was in the lead among the independents although followed closely by Packard and Hudson.

**AUTOMOTIVE MANUFACTURING ACTIVITY** bounded up to high ground during the week ended Dec. 9 and reached an unadjusted index level of 301 on the above chart. A slight easing during the following week brought the unadjusted index down 3 points to 298 for the week ended Dec. 16. The adjusted index moved steadily upward through the points 258 and 265 for the weeks ended Nov. 18 and Nov. 25, respectively.

1938, or a gain of 135,000 units or 13 per cent. Of course, the 1939 last quarter would have compared far more favorably with 1938 if it had not been for the protracted Chrysler strike. The industry's ability to show a healthy increase over last year in spite of the strike is the best commentary on how steadily production has been going currently.

Sales reports indicate that most of the major producers will begin 1940 with unusually heavy banks of unfilled orders and that the weekly production rate will continue at approximately current



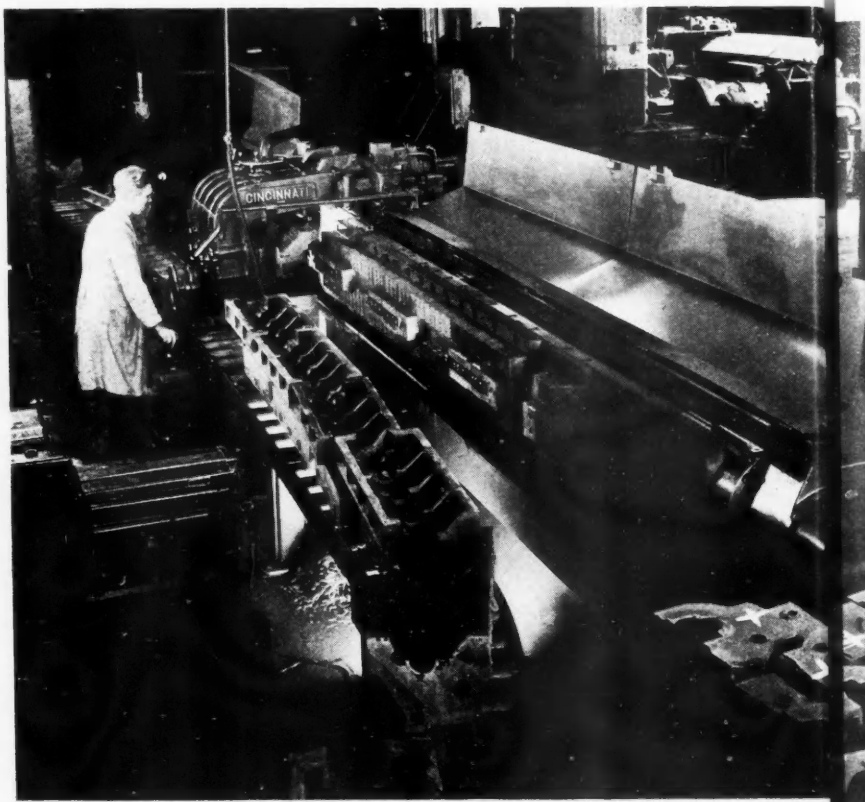
*Cover up to show the detail of the broaching tool employed in the Cincinnati horizontal hydraulic surface broaching machine used for finishing bearing locks and panrail. The hydraulically-operated, tilted work fixture may be seen at the extreme left.*

**W**ITH the launching of four brilliant lines of cars for the 1940 season, at the lowest prices in its long history, Packard revealed the culmination of a four-year manufacturing plan which went into operation concurrently. Out of a management philosophy activating this program has evolved an entirely new plant—new in arrangement, new in layout, and new in basic manufacturing procedure when compared with the Packard plant of but a year ago.

For the inception of this program we have to go back to 1935, the year when the now famous Packard 120 was introduced. Public acceptance of the 120 and its subsequent companion, the Six, began to strain the then new production facilities and impressed the management with the ultimate need for a major expansion program. Too, the entire industry was feeling the slower tempo of big car buying and, naturally, this was reflected in the demand for Packard Senior cars. This combination of influences pointed to the need for recasting the whole manufacturing set-up on a basis compatible with current operating conditions.

It is our intention to picture a perspective of what has been accomplished and to mirror within the obvious limitations of a high-spot study, the results of an activity splendidly executed.

Consider the practical problem of visualizing a complete recasting of a plant spread over an expanse of 89 acres, particularly while this plant still was busily engaged in turning out its share of fine car market. Consider, too, that at some given stage of the game it would be necessary to demolish what was and create an entirely new pattern. Unobtrusively, so far as the outside world was concerned, this activity was begun early in 1939, and with Herculean energy the whole



# Packard

## *has new arrangement for 1940 production*

was completed in an exceedingly short space of time.

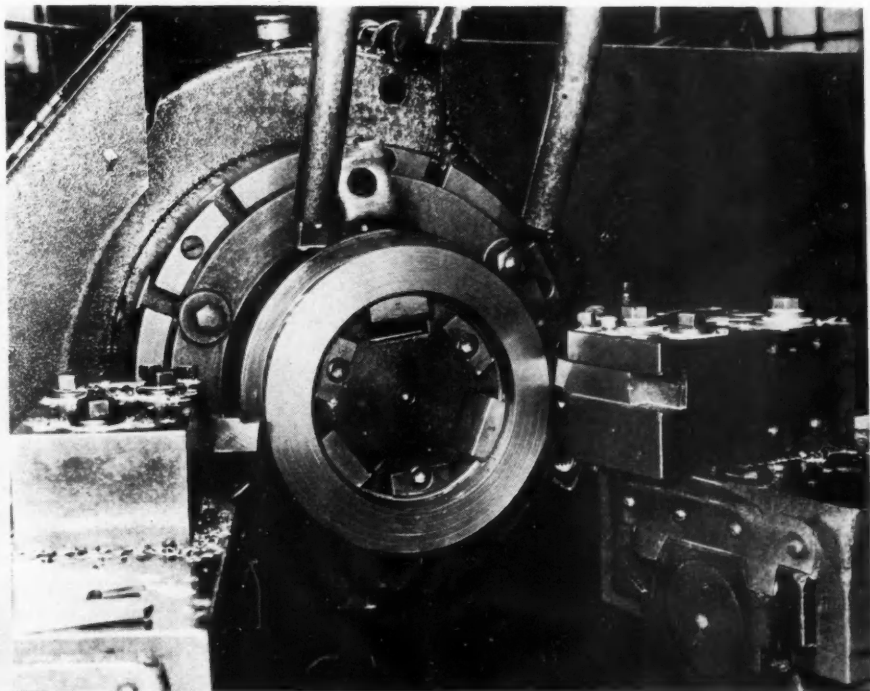
Visible symbol of the new order is the handsome arched bridge spanning East Grand Boulevard. It serves as the artery between the buildings on both sides of the Boulevard; it is a link in the magnificent conveyORIZED materials handling system, now a vital part of the production scheme.

Those who are familiar with the Packard plant of yesterday, as described in *AUTOMOTIVE INDUSTRIES*, May 2, 1936, will find that the former 120 and Six plant has been moved out of its accustomed quarters, the structure being converted into a plant devoted exclusively to body building and the production of all manner of stampings. This provides needed facilities and elbow-room for Packard's body building requirements. Completed bodies are transported smoothly on a floor conveyor in the bridge, moving to the assembly building according to schedule and without the interruptions formerly encountered in crossing the wide boulevard with its teeming city traffic.

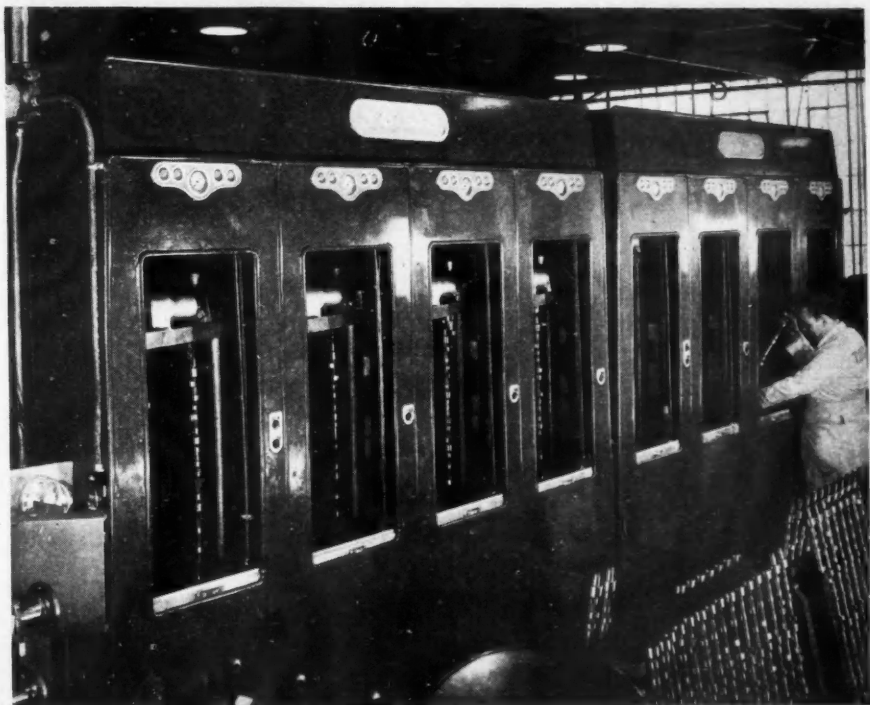
*This is the Forty-fourth  
in the series of monthly  
production features*



**Haynes-Stellite J-Metal tooling is used in the rough-facing, rough-turning, and chamfering of the rear axle ring gear, drop-forged from SAE 5120 steel.**



**Battery of the new Tocco induction - hardening machines found in the Packard camshaft department.**



PRODUCTION

## Routing of Crankshaft

### OPERATION AND EQUIPMENT

**MILL** locating spot on Checks, No. 1 and No. 9, No. 4 and No. 6.

Productomatic milling machine

**FACE** all main bearing cheeks. Rough face all main bearing walls. Rough face flange, oil thrower and front end.

**ROUGH TURN** all main bearings front end, flange and oil thrower. Rough face both ends. Finish broach all main bearings and walls, flange and oil thrower front end

Wickes semi-automatic main bearing crankshaft lathe

**ROUGH AND FINISH** all pin bearings, walls and fillets

LeBlond pin turning lathe

**DRILL** No. 22 oil holes in No. 1-4-6 pin bearings

Leland-Gifford drill press

**DRILL** No. 22 oil holes in No. 2-3-5 pin bearings

Leland-Gifford drill press

**DRILL** 1/4 inch oil holes in No. 1-2-6 pin bearings

Leland-Gifford drill press

**DRILL** 1/4 inch oil holes in No. 3-4-5 pin bearings

Leland-Gifford drill press

**STRAIGHTEN AND BLOW OUT** oil lines

**RECENTER** both ends and blow off, also chamfer all oil holes

Lodge and Shipley engine lathe

**FINISH GRIND** No. 2 main bearing and walls

Norton grinder

**FINISH GRIND** No. 3 main bearing and walls

Norton grinder

**FINISH GRIND** No. 1 main bearing and walls

Type D Landis plain grinder

**FINISH GRIND** rear main bearing and walls

Type D Landis plain grinder

### OPERATION AND EQUIPMENT

**FINISH GRIND** front end

Norton grinder

**FINISH GRIND** pilot and face of flange

Norton grinder

**FINISH GRIND** all pin bearings and walls

Norton universal pin grinder

**MILL** keyway in front end

No. 2 Kent-Owen hand mill

**DRILL, COUNTERSINK, REAM** and **TAP** front end

**DRILL, CHAMFER, UNDERCUT** and **SEMI-REAM** pilot hole. Drill, chamfer, ream and tap 6 holes in flange

Natco horizontal drilling and tapping machine

**FINISH** pilot bearing holes

LeBlond lathe

**FINISH** turn oil thrower and cut oil return thread

American lathe

**BURR** keyway and end of shaft pin bearing walls; also check where milled for locating spots

**STRAIGHTEN**

**STATIC BALANCE**

**DRILL** for balance

Barnes drill press

**CHECK** for balance. **GRIND** cheeks for balance

**REDRILL** for balance when necessary

Polish all main pin bearings

Shraner model B hydraulic polish machine

**WASH** shaft

**TEST** oil lines

**BLOW OUT**

**INSPECT** for runout

**RECHECK** for balance when necessary

**INSPECT AND BLOW OUT** oil lines

ments, to touch-up stations in production departments and along repair inspection lines.

Not only has the program resulted in a unified and balanced production layout, in which materials handling has been completely mechanized, but it has equalized production costs to the extent that the full economies inherent in the large production cars are passed on to the higher priced lines.

Let us examine the actual details of manufacturing plant as the visitor sees it today. Much of the activity in which we are primarily interested is found in the main floor layout of the "S" division.

Car assembly starts at the front end of the main building, at the Boulevard, with separate lines for frame assembly, chassis assembly, and the rear axle assembly department, which is concentrated at this end. These lines are located at right angles to the main assembly line which extends the entire length of the building along the outer bay.

The final assembly line is composed of a number of separate sections. First is

the chassis assembly conveyor, terminating at the body drop, then continuing as the final assembly line on a floor conveyor served by a working pit extending its full length. Total length of the two conveyor lines is 1,464 feet. In considering the scheduling of the assembly line it is of interest to note that although for reasons of expediency both the rear axle and motor assembly are established on the main floor and feed the line by monorail, other important subassemblies such as the transmission, front end sheet metal unit, hood assembly, body, etc., are prepared on stations on the second floor, located directly above the point of usage, and are delivered through suitable openings in the floor.

At this point it must be borne in mind that all four series cars go over the same line according to schedule. To facilitate this movement, the forward section of the chassis conveyor is provided with brackets for engaging the chassis, so spaced as to accommodate the full range of wheelbases—from 127 in. to 158 in.—without any adjustment. The last section of the conveyor, after the body drop, is of floor type. At the end of this conveyor, the assembly load is divided

All of the machine shops for producing engines and parts for the 120, for the 110, and the new 160 and 180, are concentrated in the self-contained manufacturing plant on the other side of the boulevard. New chassis conveyor lines were erected in the new main plant to care for a greatly increased production. These, added to the body conveyor system, total a length of two and one-quarter miles. Production lines for conveying rear axles, differentials, motors, wheels, fenders, and other parts, add more than another mile and three-quarters, giving a grand total of some four miles of major conveyor systems—one of the most efficient in the entire industry.

Other departments, such as the modern plating shop, heat treat, drop forge, and foundry remain as before, except for touches of modernization and items of new equipment to be mentioned later.

The final touch was the installation of a centralized paint mixing department with a distributing system comprising some 25 separate pipe lines totaling over eleven miles in length. Paint of uniform quality and color specification is delivered to the spray booths in the body plant, to the sheet metal finishing depart-

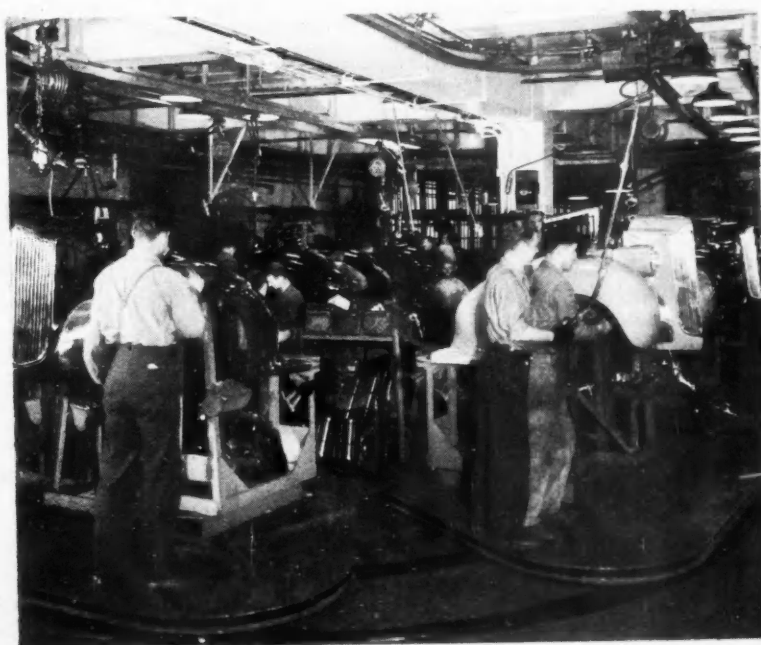


The upper illustration shows cylinder bores being inspected and graded with the aid of the Pratt & Whitney Electro-limit gage. Below is seen an unusual arrangement for final assembly of front end sheet metal in this merry-go-round conveyor line with its large work platforms.

between two sets of separate lines so as to facilitate the slower final operations. Finished cars are routed first to one of two chassis roll fixtures, then wheel alignment fixtures, then headlamp adjustment.

The cars now are routed to one of two inspection and repair lines, passing through new water test or "rain" test booths which prove the weather tightness of the entire car. To avoid delays, cars that require "heavy" repairs of any kind are run off the line to floor stations, then are returned for recheck on the final line. Some impression of the magnitude of such operations may be gained from the fact that the mechanized lines for final inspection and repairs have a total length of 2,016 feet.

Outstanding feature of the assembly line and its



### Factory Executive Personnel

G. T. Christopher	Vice-President of Manufacturing
Burr W. Fitch	Budgets Manager
R. R. Rees	Plant Engineer
A. J. Reddy	Master Mechanic
E. T. Phillips	Production Manager
O. F. Sepanek	Chief Inspector
G. F. Daschke	Supt. of Forge Shop
F. Carpenter	Supt. of Foundry
Oscar Findling	Supt. of Assembly Division
Henry Winfield	Supt. of Stamping Division
F. J. Bird	Supt. of Body-Division
	Supt. of Motor Division

repair sections is the installation of the modern high intensity lighting system which provides excellent "seeing" and at the same time, due to the absence of glare, permits inspectors to detect any flaws in the finish.

At the present time, one of the repair lines is provided with a long drying oven made by Drying Systems, representing the latest equipment of its kind. The second line is to be fitted with a twin installation later this year.

Completing the facilities at the end of the final line prior to delivery are individual mechanized polish lines.

An important by-product of the plant realignment is the finished car storage which occupies the floor immediately above this portion of the assembly building. Final inspected cars are driven up a ramp from the main floor and parked above, according to shipping instructions.

Engine parts machining and assembly are concentrated on the main floor, occupying all of the floor space except for the sections devoted to heat treat and plating. An adjunct to this is the new engine block testing department served by a centralized fuel distributing station which pipes natural gas to each block; also a central filtering and lubricating oil distribution system piped to each stand, assuring a circulation of

clean, cool lubricant for all of the engines on block test.

Coming to the details of the machine shops, we have found it expedient to indicate the nature of the activity by reproducing the official factory routings for certain major parts—camshafts, crankshafts, cylinder blocks, connecting rods, pistons. It is worthy of note that the principal machining operations have been split up to provide separate lines for each of the major parts of the three engines. However, in some cases all of the work is carried through the same department. This is true of the camshafts, cylinder heads, and connecting rods on the motor line; and likewise true of the rear axle and case, and front end suspension parts.

On the Six and Eight cylinder block lines, the blocks

all go over the same line for the initial broaching operations, then divide for the major schedule, converging to the same line for inspection purposes.

Engine sub-assembly is handled on a gravity roller conveyor, then transferred to a power-driven conveyor line for the final assembly operations. Interesting departure from the conventional is the painting of engines before the block test, in special spray booth stations.

It will be recalled that one of the unique fea-

## Motor Cylinder Assembly

### OPERATION AND EQUIPMENT

**CHAMFER** bottom of cylinder bores  
Moline drill

**CORE DRILL, SEMI-FINISH** and **FINISH BORE** cam and crank bores. Chamfer rear side of all cam bores. **COUNTERBORE** rear cam hole. **REAM** 2 dowel holes in rear end  
Ingersoll 3-station boring machine

**DRILL-BORE** and **REAM** oil pump and distributor shaft holes. **COUNTERBORE** distributor shaft hole. **DRILL** two 7/16 holes in oil pump pad. **DRILL AND TAP** two 5/16 holes in oil pump pad. **DRILL AND TAP** 2 5/16-18 in distributor pad. **FINISH SPOTFACE** oil pump pad

Baush drum type machine

**CORE DRILL** valve throats—drill, **ALIGN** bore and **REAM** valve guide and tappet holes. **DRILL** 4 water circulating holes on top of block. **SPOTFACE** bottom of valve tappet bosses 1-1/16 inch diameter

Baush drum type drilling machine

**MILL** angular valve clearance  
Ingersoll 12-spindle vertical milling machine

**PLANETARY MILL** front crank bearing (both sides). Mill chamfer and oil slinger groove. Remove from No. 4 bearing support

Newton planetary milling machine

**SEMI-FINISH BORE** cylinder bores  
Ingersoll cylinder boring machine

**FINISH ALIGN REAM** crank and cam bores

**SPOTFACE** valve spring seats, chamfer top of tappet bosses  
Ingersoll 6-spindle facing and chamfering machine

**FINISH ALIGN** ream valve guide and tappet holes

Moline drill press

### INSPECT AND WASH

**APPLY PERMATIX** to plugs and assemble three core hole plugs, ream No. 4 main bearing hole, burr and redrill 2 water holes.

**PRESS IN VALVE** stem guide bushings

25-ton Oilgear press

**FINISH REAM** valve guide bushings  
No. 65 Moline drill

### OPERATION AND EQUIPMENT

**FINISH REAM** valve throats and countersink

No. 65 Moline drill

**FINISH REAM** cylinder bores and chamfer top of bores

Ingersoll cylinder reaming machine

**BLOW OUT** stud holes and valve ports, assemble head studs

**ROUGH HONE** cylinder bores

Barnes Drill Co. No. 214 cylinder honing machine

**FINISH HONE** cylinder bores

Barnes Drill Co. No. 214 cylinder honing machine

### INSPECT

Electrolimit comparator

**CHAMFER** valve seats

**GRIND** valve seats

### INSPECT

## Routing of Camshaft

### OPERATION AND EQUIPMENT

**CENTER** both ends

Seneca Falls automatic centering machine

### STRAIGHTEN

General flexible press

**GRIND** steady rest spot

Norton grinder

**TURN** Nos. 1-2-3 bearing diameters, gear diameter, sprocket and thread diameters, face and chamfer No. 1 bearing face, undercut sprocket and thread diameters, and chamfer end

Lo-Swing lathe

**TURN** No. 4 bearing, chamfer Nos. 2-3-4 bearing gear diameter

Lo-Swing lathe

### STRAIGHTEN

General flexible press

**ROUGH GRIND** 4 main bearings and finish grind gear diameter

Norton grinder

**FINISH MILL** keyway

Kent Owen mill

**ROUGH GRIND** cams and fuel pump eccentric

Landis semi-automatic cam grinder

**CUT GEAR** (13 teeth) in relation to center-line of No. 1 exhaust cam and sprocket keyway

Lees-Bradner gear hobber

### OPERATION AND EQUIPMENT

**REMOVE BURRS**

**DRILL** oil holes in No. 1 and No. 2 bearings  
No. 2-14 Leland-Gifford 1-spindle drill

**CHAMFER** all holes  
U. S. reamer drive

**CUT THREAD** one end of shaft  
Landis threading machine

### INDUCTION HARDEN

Tocco hardening equipment

**CLEAN OUT** centers

Sipp drill press

### STRAIGHTEN

General flexible press

**FINISH GRIND** all main bearings

Norton semi-automatic grinder.

**FINISH GRIND** sprocket diameter and thrust shoulder

Norton grinder

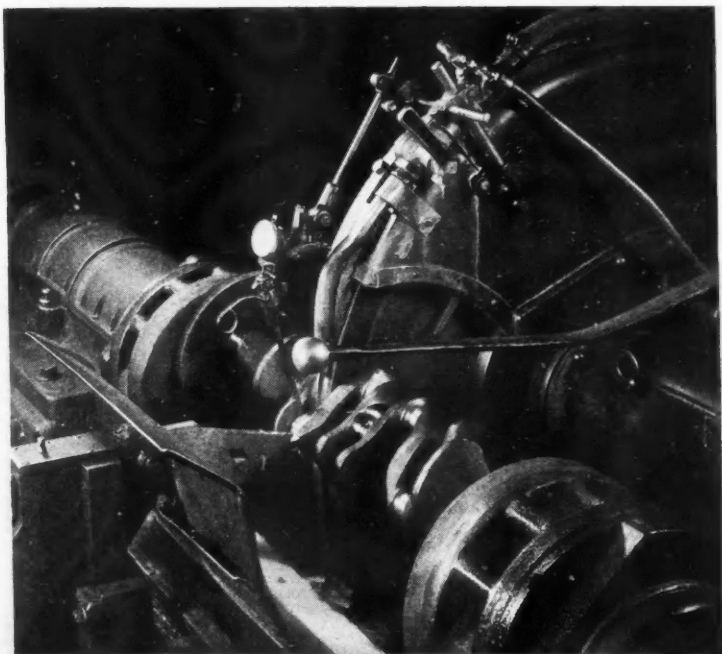
**FINISH GRIND** cams and fuel pump eccentric  
Landis semi-automatic camshaft grinder

**POLISH** main bearings and file burrs from gear

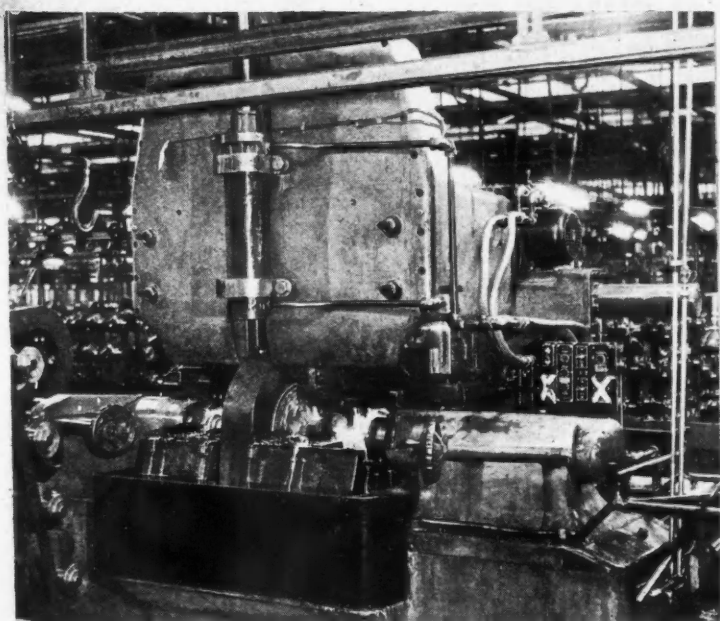
Reed polishing lathe

### STRAIGHTEN

### INSPECT



*The top view is a close-up of Norton universal pin grinder, finish-grinding pin bearings and walls while the lower view shows a huge Wickes Bros. combination crankshaft turning machine with vertical surface broaching attachment, the first of its kind.*



The new Super Eight engine, rated 160 hp., which makes it the largest straight eight in the passenger car field, naturally is tooled up separately on a line of universal equipment due to the moderate volume of production. Quite an unusual feature is a huge Newton drum type milling machine which is provided with a fixture accommodating sets of the principal castings—the block, cylinder head, and flywheel housing, all of which are rough and finish-milled in the one setting. The Ingersoll milling cutters used on this machine have J-metal inserts.

On the second floor of the "S" division building, we can start at the terminal of the arch from the second floor of the body plant across the boulevard. In the body plant, bodies are transported on overhead monorails; on this side, they are handled on special trucks. Immediately upon entering the "C" building, trunk interiors are sprayed with "flock"; then the rear fenders are attached. The bodies then are routed to a storage section where they await scheduling to the body drop for the final assembly line.

Next in order is hood assembly on a special conveyor, this department being located close to the point of usage on the floor below. Much interest will be found in the department for the assembly of the entire front end unit consisting of the radiator and shell and front fenders. The grille is assembled, first, on wood fixtures; then the shell is installed on another line. This unit is then carried to a platform conveyor on which the radiator cradle and core are fitted. Finally

the last sub-assembly goes to a unique merry-go-round conveyor where the fenders are attached. The entire self-contained unit is scheduled to the assembly line below.

The second floor boasts a customer delivery section where drive-away cars are fitted with accessories, special features, then waxed, and serviced ready for the road.

The third floor provides facilities for painting wheels and such attachments and accessory items as require finishing in synthetic enamels. Wheel and tire assemblies are made up on this floor, being delivered

tures of the cylinder block machine line for the Six and Eight is the special Ingersoll Power-Pack equipment which was installed in 1934 for the economical production of "120" at the time of its introduction. Flexibility of change-over was cited as one of the principal advantages of the Ingersoll equipment, i. e., the ability to accommodate changes in tooling and fixtures and even primary machine heads as seasonal product changes were found necessary. It is apparent that this claim has been substantiated over the years, since much of the original investment in the machinery still is giving service on the 1940 product.



## Principal Dry-Sys Ovens

"X" DIVISION BODY FINISHING	TEMPERATURE DEG. FAHR.	TIME (MIN.)	TYPE OF HEAT
Dry off after Deoxidene clean .....	300	7	Gas-fired direct air
Primer-Surfacer .....	275	65	Gas-fired indirect air and steam
Dry off after water sand .....	240	8	Indirect steam
Final lacquer .....	220	28	Gas-fired indirect filtered air
Touch up .....	200	10	Indirect steam
Bodies are carried through all of the above ovens in steel cradles by a continuous overhead monorail conveyor. All ovens in this group are open end floor type ovens.			
FENDER AND HOOD FINISHING	TEMPERATURE DEG. FAHR.	TIME (MIN.)	TYPE OF HEAT
Fender and hood finishing .....	225	30	Gas-fired indirect filtered air
Parts are carried through the above oven on steel hooks suspended from overhead monorail conveyor. This is an open end floor type oven.			
SENIOR BODY FINISHING			
Dry off after Deoxidene clean .....	280	15	Gas-fired direct air
Primer-surfacer .....	200	68	Indirect steam
Final lacquer .....	200	50	Indirect steam
Bodies placed on trucks and trucks are moved through oven on floor type single strand conveyors with pusher dogs. Ovens in this group are open end floor type ovens.			
FINAL ASSEMBLY			
Surfacer and lacquer touch up .....	200	11	Gas-fired indirect filtered air
Wheels .....	235	60	Indirect steam
Small parts .....	235	40	Indirect steam
Wheel ovens have a trolley conveyor with special fixture on 30 inch centers. Each fixture carries 2 wheels (one wheel on each side of conveyor). Small parts ovens are equipped with monorail conveyors from which parts are suspended on hooks. Ovens in this group are the bottom entry type.			
Prime coat .....	225	15	Indirect steam
INSTRUMENT PANELS			
Ground coat .....	300 to 400	45	Gas-fired indirect filtered air
Lacquer .....	150 to 220	20	Gas-fired indirect filtered air
These ovens are of box type with doors at both ends and are used for the "DI-NOC" graining process (Decalcomania photo-film transfer).			

to final assembly on a long conveyor line. There is provision for machining certain axle parts on the same floor.

The fourth floor is arranged for the finishing of various sheet metal parts such as radiator shells, fenders, and hoods. For this purpose the department has been provided with a complete system of overhead conveyors, not only for transporting in the department and through the various preparatory and painting operations, but also for delivery to the various assembly lines. The mechanized transportation system reduces handling, minimizes rejects, and assures excellent quality control.

The paint shop has been equipped with the most modern spray booths known in the industry, comprising an installation of four double spray booths of the familiar water wash types with a positive exhaust system for removing dust and fumes and odors. The installation includes spray booths supplied by Newcomb-David and R. C. Mahon. These spray booths have the valuable feature of providing a means of salvaging the paint overspray, which is recovered from the waste chambers and can be used for many odd paint and sealing jobs where the parts are not exposed to the eye.

In addition, there is an installation of four Drying Systems baking ovens of full automatic control type which further assure uniform paint quality.

Supplementing these facilities, are a new water deck and lacquer polishing lines.

The fifth floor is equipped for the cleaning and priming of radiator shells, hoods, and fenders, preparatory for the final lacquering operations on the fourth floor. Too, there is a small parts enameling oven for the enameling and baking of miscellaneous small parts. In addition, welding equipment has been provided for the miscellaneous assemblies of sheet metal parts and fittings ahead of the paint line.

Shifting the scene to the body building across the boulevard, we find that all traces of the previous manufacturing activity have disappeared, revealing in turn, a beehive activity in the greatly expanded plant now available for body production. Under the new arrangement the various departments such as body in white, paint, and trim have been rearranged completely and greatly expanded in floor space. Trim department assembly lines have been lengthened and revised so as to provide separate lines for various types of bodies. At the same time, the sewing rooms serving these lines have been enlarged to handle the increased production demand.

The paint department on the third floor has been considerably expanded and provided with additional oven capacity to handle the increase in production schedules and to promote high quality standards.

One of the interesting lines in the body plant is a closed circuit merry-go-round conveyor line for the assembly of convertible model tops. Heretofore the tops had to be installed after the body was in place on the chassis.

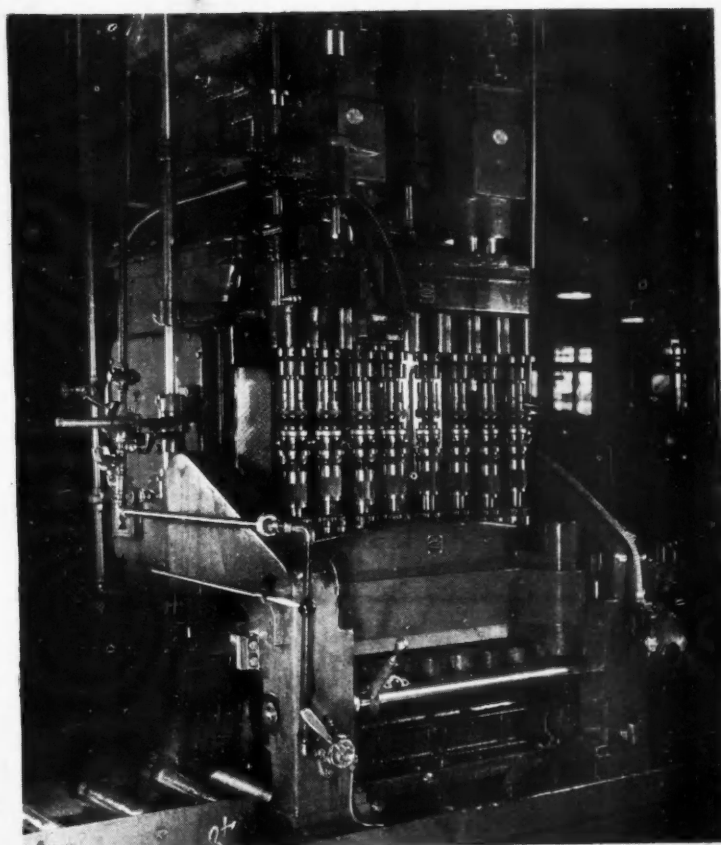
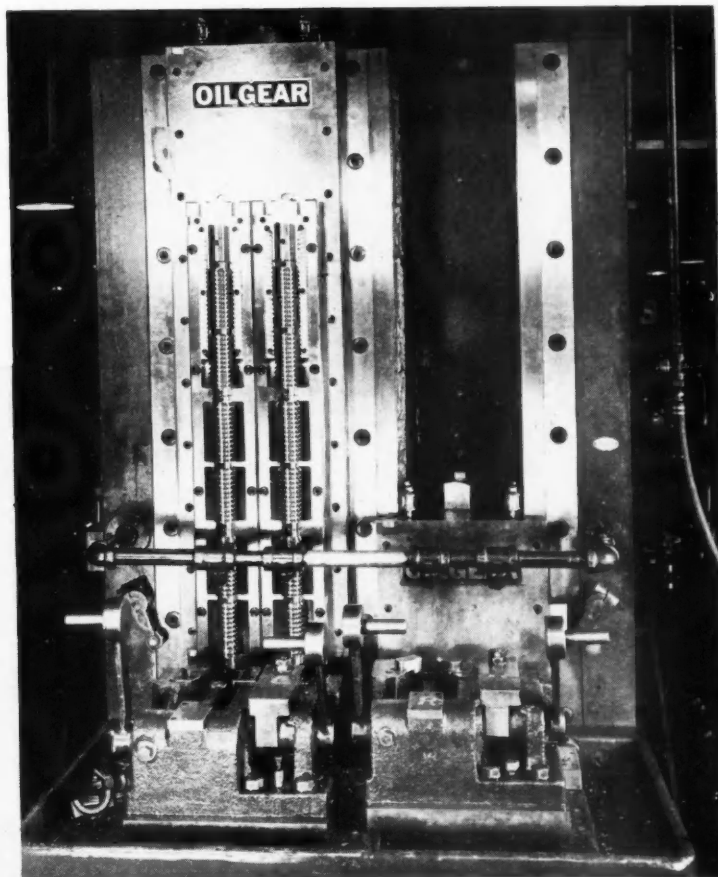
Two views are shown here. The lower is one of a battery of modern Barnes Drill Co. honing machines, fitted with eight Micromatic honing tools. The upper one shows a close-up of work table and tooling of the 16-ton, twin-ram Oilgear vertical surface broaching machine, broaching the joint face and half-round bore in connecting rod and cap sets.

Another of the many outstanding departments in the body plant is the big merry-go-round conveyor line for the spot welding of various parts on the all-steel roofs.

### **Special Equipment Notes**

As a matter of convenience, we have set apart this section for the purpose of describing a few of the special items of equipment and tooling found at Packard. This is a good place to mention the outstanding plating shop which Packard placed in operation about five years ago. At that time, we complimented the company for producing facilities far ahead of then current practice in point of worker comfort and provision for excellent working conditions. The wisdom of their advance planning has been quite obvious in recent months. It may be noted that this department is now fully equipped to handle the myriad of plating details required for the full range of the product.

The plating shop has profited by the current modernization program in the acquisition of a Meaker full-automatic chromium plating machine which now replaces hand methods and assures high quality standards at reasonable costs. The machine may be described as the Meaker return type, fast transfer, full automatic plating machine distinguished by its special high-speed roller chain transfer mechanisms for rapidly transferring work from operation to operation. This unit, designed to handle plating racks measuring 30 in. wide x 46 in. long x 12 in. thickness, is especially pro-



vided with bi-polar, double-file, cathode carriers to accommodate auxiliary conforming anodes whenever required. The machine, measuring approximately 61 ft. 3 in. long x 13 ft. 10 in. wide x 16 ft. 10 in. high, deposits a substantial thickness of chromium plate on 234 plating racks per hour when operating at a conveyor speed of approximately 105 in. per minute. Plating current is furnished to the chromium plating tank by two 5000-ampere motor-generator sets connected in parallel through the plating electrolyte.

In the machine shop we shall note briefly the details of a number of outstanding Cincinnati broaching machines, the special Wickes crankshaft lathe with surface broaching attachment, and the Tocco hardening equipment in the central camshaft department.

As will be noted on the cylinder block routing, the first operation machine is a huge Cincinnati horizontal Hydro-Broach for surface broaching the pan rail and bearing cap seats on both the Six and Eight blocks. The fixture and tooling are arranged to take both blocks without any special attention. The blocks come to the machine on the gravity roll conveyor with the fixture rolled over in loading position. The fixture swings into the operating position when the operator throws a lever which actuates a hydraulic swiveling mechanism, moving the fixture through 90 degrees. The broaching tools are of inserted type with cemented-tungsten-carbide finishing tools for the end section to provide the fine surface finish specified.

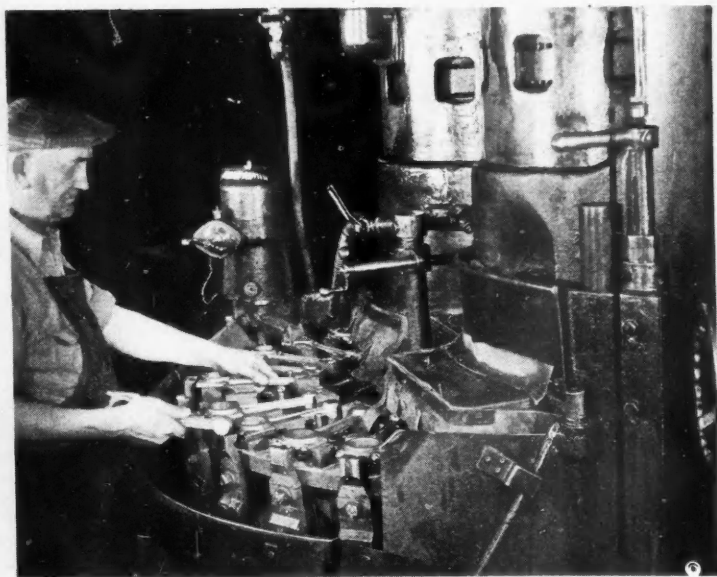
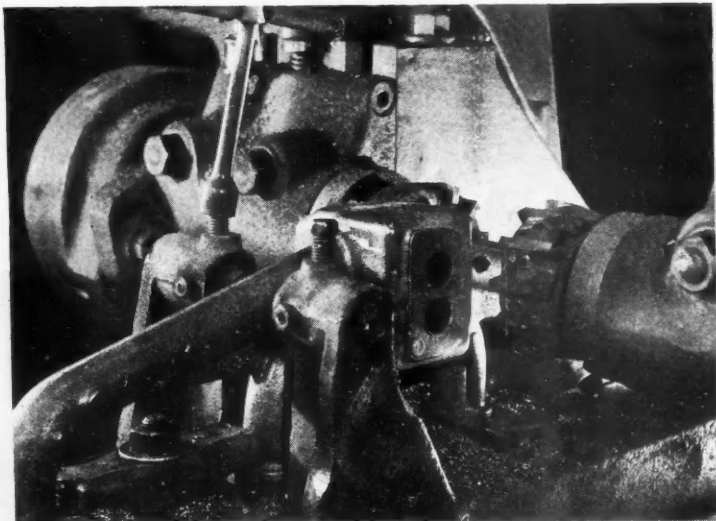
The entire operation is completed in one pass of the ram, removing approximately 3/16 in. of metal, with a net production of 45 blocks per hour. The tolerances for accuracy and flatness of surface are extremely fine in conformity with Packard standards of quality.

A second machine of the same type is used for finishing the entire top or cylinder head surface of the block.

On the connecting rod line there is a 5/42 Cincinnati vertical Duplex Hydro-Broach for broaching two locating flats and four bolt bosses in the rough forging. The machine is provided with two special hand clamping fixtures which hold the work in position by a retracting lever clamp over the crankpin boss. Productivity is 400 pieces per hour (52 min. standard time) with a ram speed of 35 fpm. Stock removal is of the order of 0.200 in. maximum.

A rather difficult piece to handle in a fixture is the

*Here is an interesting example of Carboloy tooling on a difficult job. Operation is the milling of an exhaust manifold face on hard chilled castings, using large milling cutters with Carboloy-tipped blades. The machine is a No. 33 Browne & Sharpe mill. The cutters are good for 1440 pieces per grind. The operator working at the No. 16 Blanchard grinder is grinding faces parallel on both connecting rod bosses.*



front wheel support arm forging, in which it is required to surface broach two radius rod bosses. This operation is performed on a 10/54 Cincinnati vertical Duplex Hydro-Broach, taking a right and left arm in each setting. The work is clamped by a hand-operated wedge. Productivity is 200 pieces per hour (52 min. standard time) with a ram speed of 21 fpm. Stock removal is of the order of 0.125 in.

As mentioned earlier, a distinctive feature of the camshaft production line is the process of hardening



with precision and rapidity in the new Tocco induction hardening equipment. There is a battery of eight Tocco machines arranged in two banks of four machines. Each machine takes two shafts, and while one bank is hardening a charge of eight shafts, the other bank is being unloaded and loaded.

The camshafts are made of pearlitic malleable iron. Cams and the eccentric are hardened to 60 Rockwell C, while the gear is hardened to 55 Rockwell C. Six- and eight-cylinder camshafts are produced with a net production of 43 per hour.

Another interesting example of Tocco hardening at Packard is found in the equipment for the treatment of transmission driveshafts. Here again is a set-up for selective hardening—the pilot being hardened to 62-63 Rockwell C, the large bearing diameter to 55 Rockwell C, and the end of the large spline diameter to 50 Rockwell C. These operations all are performed automatically in one setting with a production rate of approximately 125 per hour.

A truly remarkable machine of which the pioneer installation was made at Packard is the Wickes Brothers' automatic combination center drive broaching lathe, intended for the rough turning and finish turning of crankshafts in one setting. The lower part of this machine is the standard automatic center drive lathe, on the back tool housing of which is mounted the finish broaching attachment. The crankshaft is chucked in the lathe on centers in the usual manner. The push button for the main drive motor starts the

## Mechanized Materials- Handling Systems

Transmission delivery conveyor .....	200 ft.
Piston and connecting rod delivery conveyor .....	320 ft.
Crankshaft and camshaft delivery conveyor .....	1200 ft.
Wheel and tire delivery conveyor.....	1216 ft.
Tire delivery conveyor .....	920 ft.
Delivery conveyor—fenders, bonnets, lights, radiator shells, and grille parts.....	3576 ft.
Body in white conveyor line .....	1875 ft.
Body in paint conveyor line .....	2775 ft.
Body in trim conveyor line .....	3376 ft.
From body in white to body drop (total)...	8026 ft.
Frame assembly conveyor line .....	456 ft.
Chassis and final conveyor line .....	1464 ft.
Final inspection and touch-up line .....	2016 ft.
Rear axle and front end suspension assembly line .....	116 ft.
Differential carrier assembly delivery conveyor .....	340 ft.
Motor delivery conveyor to chassis line....	400 ft.
Motor delivery conveyor, spray booth, oven and block test .....	324 ft.
Motor assembly conveyor power line .....	264 ft.
Motor assembly roller conveyor line.....	208 ft.

crankshaft revolving in the lathe, after which the feed button for the rough turning tools is pressed. This starts the automatic work cycle, which continues until the machine is stopped ready to unload the crank.

Rough turning includes cheeking, turning and filleting of all main line bearings, of stub end of crank and of flange end of crank. Finish broaching includes the finishing of diameters, side walls and fillets of all main line bearings. Finish broaching is very accurate and eliminates the rough grinding operation. When the crankshaft leaves this lathe no further work is required on the main line bearings until the finish grinding operation.

At Packard, this machine turns out six-cylinder crankshafts at the rate of 8½ per hour. Broaching tools are good for approximately 5,000 cranks between sharpenings.

A survey of special equipment indicates that Packard has one of the outstanding installations of Drying System ovens to be found in the industry. In general, all of the Dry-Sys ovens have automatic temperature controlling and recording equipment. Air distribution is so arranged that the top and bottom oven temperature differential does not exceed 10 deg. Fahr., within the confines of the path of the material. Ventilation is provided at the rate of 9000 CFM per gallon of solvent evaporated.

The gas-fired ovens are constructed of interlocking steel-clad insulated panels and fitted with un-

## Routing of Cylinder

### OPERATION AND EQUIPMENT

**CHECK** cylinder block and load conveyor

**BROACH** pan rail and bearing cap seats  
Cincinnati broaching machine

**DRILL AND REAM** 2 locating holes and countersink both holes  
No. 65 Moline drill

**MILL** distributor fuel pump and generator pads, also manifold and valve cover faces  
Ingersoll milling machine

**MILL** front and rear end and mill oil pump pad  
Ingersoll milling machine

**BROACH** top  
Cincinnati broaching machine

**ROUGH BORE** cylinder bores  
Ingersoll cylinder boring machine

**DRILL** oil gallery trunk and tappet holes  
Baker hydraulic 2-way drill

**DRILL** 12 3/16 inch diameter oil holes in tappet bosses, drill one 3/8 inch diameter circulating hole in water pump face, **REAM** front of tappet oil gallery hole, **TAP** rear of tappet oil gallery hole  
Natco 3-way drilling and tapping machine

**DRILL** 4 oil lead holes, 1 filler hole, 1 gage hole, 1 oil suction hole  
Natco special angular drilling machine

### OPERATION AND EQUIPMENT

**DRILL** 4 oil connection holes, ream 1 oil filler hole, tap 1 oil suction hole, and test oil lines

Natco special angular drilling and tapping machine

**MULTI-DRILL** holes in top side, front side and rear end  
Natco 3-way drilling machine

**CHAMFER** all tap holes in top, front and rear ends and 4 oil lead holes in manifold side  
Electric Hi-Cycle hand drill

**MULTI TAP** holes in top side front and rear ends  
Natco 3-way tapping machine

**TURN BLOCK** over and mill bearing locating slots and **ROUGH MILL** rear face of front crank bearing  
Newton special milling machine

**MULTI DRILL** holes in bottom side, manifold side, fuel pump pad and water side  
Natco 3-way drilling machine

**CHAMFER** all tap holes in bottom manifold and water side and shake out chips

**BLOW OUT** all holes and **MULTI TAP** holes in bottom side, manifold side and water side  
Natco 3-way tapper

**BLOW OUT** bearing cap seats and **ASSEMBLE** bearing caps in motor cylinder block

derwriter-approved safety devices, including safety pilots and automatic ignition. All open end, floor type ovens are equipped with air seals. See table of installations on page 10.

The perishable tool set-up is most progressive and features such items as the Borereamer, developed by Packard tool engineers several years ago; Carboloy tipped tools; and Haynes-Stellite J-Metal inserts on various milling cutters.

Referring to the connecting rod routing we find that eight Borereamers are used on the 16-spindle Davis drilling machine. Too, Borereamers are used on the 4-spindle Edlund drill for finishing the crank pin hole. Borereamers are used extensively on other operations not mentioned in detail here.

Carboloy tipped tools are found in profusion, wherever economical to apply, principally on cast-iron machining for parts such as differential carrier and housing, flywheels, flywheel housings, manifolds, pulleys, water pump body, transmission cases and bearing retainers, valve guide bushings, etc. Carboloy also is used on the malleable iron steering gear housing; brass and bronze bushings, and the precision-boring of main and connecting rod babbitt bearings.

Piston turning on the New Britain lathe is tooled completely with Carboloy, this being one of the many operations where cemented-Tungsten-carbide is indispensable for economical metal removal. Another interesting application is the use of a Carboloy lined busing in the tool block of the Landis camshaft grinder.

## Routing of Piston

### OPERATION AND EQUIPMENT

**ROUGH TURN** outside diameter of ringlands, rough form three ring grooves, rough face and center closed end, face and chamfer open end. Finish bottom of ring groove

No. 14 New Britain automatic lathe

**DRILL** 12 5/32-in. holes in No. 3 ring groove and blow out chips

Kingsbury drilling machine

**CORE DRILL** wrist pin hole, cut lock wire grooves, drill hole in skirt, saw two slots under number 3 ringland and one slot in skirt

Greenlee drilling and sawing machine

**REAM WRIST PIN HOLE**

U. S. reamer drive

**RECENTER** closed end, face and chamfer 45 degree angle, open end

Sundstrand automatic lathe

### OPERATION AND EQUIPMENT

**FINISH TURN** outside diameter of ringlands, finish form ring grooves, chamfer and finish face head, burr sharp edges at ring grooves

Sundstrand 10 inch automatic stub lathe

**ROUGH GRIND** outside diameter

Cincinnati hydraulic piston grinder

**FINISH GRIND** outside diameter

Cincinnati hydraulic piston grinder

**FACE OFF** center boss

No. 2 Leland-Gifford single spindle drill press

**WASH** in oleum spirits and blow off

**BORE** piston for weight

Morris piston balancing machine

**DIAMOND** bore wrist pin hole

Ex-Cell-O Precision boring machine

**REMOVE ALL BURRS**

**WASH**

**TIN PLATE**

## Routing of Connecting Rod

### OPERATION AND EQUIPMENT

**CHECK FOR STRAIGHTNESS** and straighten

Straightening fixture

**CHAMFER** one side of piston pin boss

Barnes drill press

**BROACH** both sides of bolt bosses and nut and bolt seats

5-24 Duplex Cincinnati vertical hydraulic broach

**SAW CAPS FROM RODS**, leave stock on joint face for finish

34-36 Cincinnati Hydromatic mill Cincinnati milling machine

**BROACH JOINT FACE** and half hole in rod and cap

XD-32 Oilgear, 16-ton vertical twin spindle broach

**DRILL and REAM BOLT HOLES** in rod and caps. **DRILL** No. 30 and 56 oil holes in rod and countersink 90 degrees to 13/32 in. diameter mill lock grooves in rod and cap

Greenlee drilling machine

Model C Natco hydraulic drill

### OPERATION AND EQUIPMENT

**COUNTERSINK BOLT HOLES** in rod and cap

U. S. Reamer drive (pedestal type)

**DRILL** No. 56 and 30 oil holes in rod

2-spindle Allen drill press

**MILL LOCK GROOVES** in rods and caps

Kent-Owen hand mill

**DRILL** long OIL HOLE through web

Leland-Gifford 6-spindle drill press

### INSPECT

**SELECT** and **ASSEMBLE** rod and cap using bolts and nuts

**GRIND FACE** of both bosses parallel

No. 16 Blanchard grinder

**DRILL** and **REAM** wrist pin hole

Davis 16-spindle horizontal drill

**BORE** and **REAM** crank pin hole

4-spindle Edlund drill press

**CHAMFER** piston pin hole

U. S. reamer drive

**CHAMFER** crank pin hole, both sides

Cincinnati drill press

Two additional Carboloy applications are worthy of special note. One of these is on the Newton mill for facing the joint surface of the flywheel housing and boring of the transmission pilot hole, using a special 12-in. cutter tipped with Carboloy. This operation is performed at 188 surface feet per minute, with 0.020 in. feed per min., and 0.030-in. depth of cut. Tools are good for 5,280 pieces per grind.

The other job is milling of an exhaust manifold face on a No. 33 Brown & Sharpe Mill, where the work is a hard, chilled casting. The operation is performed with an end milling cutter with Carboloy-tipped inserts, with a surface speed of 157 fpm., at 102 rpm. of the cutter and feed of 0.040 in. per revolution. The tools are good for 1,440 pieces per grind.

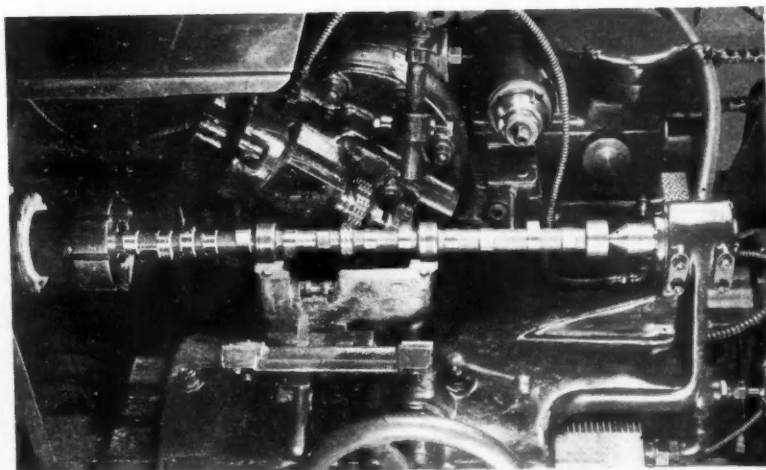
Haynes-Stellite J-Metal tools are widely used in milling cutters on cast iron for roughing and finishing operations on cylinder heads, for rough boring cylinder blocks, for milling, facing, turning, and boring other cast-iron parts. Cylinder heads for the Sixes and Eights, for example, have the top and joint faces finished on the huge Niles drum-type miller, using Ingersoll milling cutters with inserts of J-Metal. The cylinder blocks exhibit a profusion of milling cut-

## End Cap

### OPERATION AND EQUIPMENT

**WEIGH and HOLLOW MILL** large end  
Garvin horizontal drill  
**BURR HOLES** in crank and piston pin  
hole and blow out long hole  
**PRESS IN BUSHING** and burnish hole  
Fox double ram hydraulic press  
**CHAMFER BUSHINGS** in piston pin  
hole  
U. S. reamer drive  
**WEIGH and HOLLOW MILL** small end  
both sides  
Garvin horizontal drill  
Rockford drill  
**GRIND** large hole  
Heald gagematic grinders  
**WASH and BLOW OUT**  
**DIAMOND BORE** piston pin hole  
Ex-Cell-O 6-spindle diamond boring  
machine  
**REMOVE BURRS**  
U. S. reamer drive  
**CLEAN OIL HOLE**  
**WASH and BLOW OFF**  
**INSPECT**

Directly below is seen a Lees-Bradner gear hobber employed in cutting the camshaft gear. The other view is a Natco three-way drilling and tapping machine on the cylinder block line.

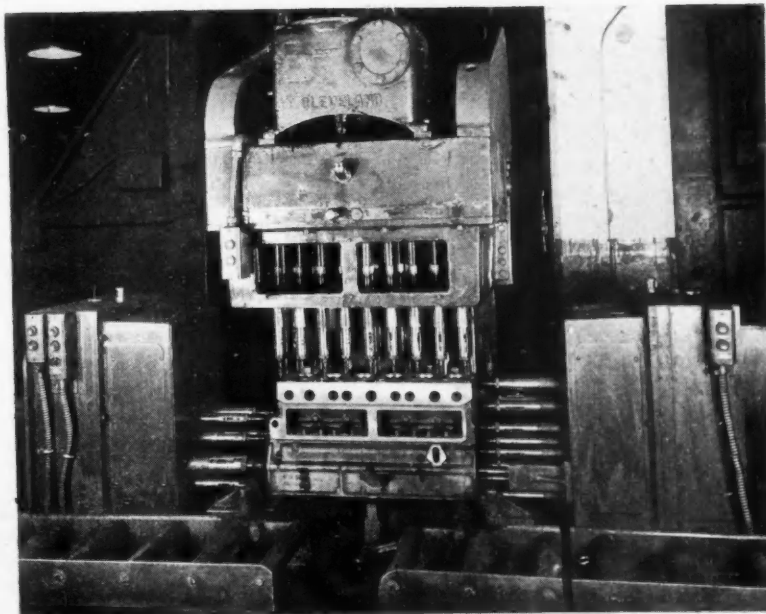


ters with inserts of J-Metal. The Ingersoll boring machine for rough boring and chamfering cylinder bores has tools fitted with J-Metal inserted blades, cutting with surface speed of 100 fpm., feed of 10.5 in. per minute, and depth of cut of  $\frac{1}{8}$  in.

An interesting alloy steel machining operation with J-Metal tooling is the rough facing, rough-turning, and chamfering of the rear axle differential drive gears, which is drop-forged from SAE 5120 steel. With J-Metal tools this operation is performed at a surface speed of 199 fpm., feed of 0.021 in. per revolution, and depth of cut from  $\frac{1}{16}$  to  $\frac{1}{8}$  in.

Excellent picture of the painstaking care to assure Packard quality is found in the profusion of gages, micrometers, and special inspection equipment used to control the individual machining operations.

Honing of cylinders is performed in two operations on Barnes machines fitted with Micromatic hones. The finish-hone operation is checked with the Pratt & Whitney Electrolimit cylinder bore comparator. Many precision grinding operations on crankshafts, cam-



shafts, pistons, and other parts are checked with Arnold gages. Hirth gages for measurement in tenths of a thousand are found on the piston job. Grading of pistons for scheduling to the motor assembly line is accomplished with the P & W Electrolimit gage.

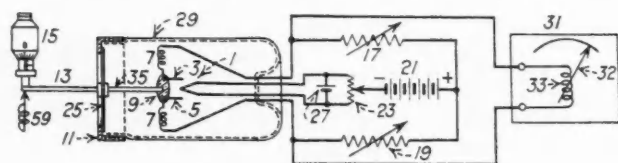
The P & W Hirth internal gage and comparator gage are both used on con. rod inspection for the large bore, while the Electrolimit gage is employed in checking the small diamond-bored hole.



## Method of Measurement For Minute Movements

**A**T THE annual meeting of the American Society of Mechanical Engineers, which was held in Philadelphia, Dec. 4-8, a number of papers of automotive interest were presented. Quite a stir was caused by a statement in a

between them, or one heated electrode with two movable plates on opposite sides of it. When the electrode is heated the interior of the vacuum tube is conducting, and the gaps between the heated electrode and the two plates



Circuit diagram of the tube for the electrical micrometer.

paper by Dr. Alexander Klemin of the Guggenheim School of Aeronautics, New York University, that a 42-cylinder liquid-cooled aircraft engine is under development for the U. S. Army. The paper, however, dealt almost exclusively with engines now in production, and no details of the new multi-cylinder design could be obtained.

At a session devoted to problems of dynamics some recent developments in methods of measurement where minute movements are involved were disclosed. R. Fanning and W. V. Bassett described the measurement of impact strains by means of a carbon-strip extensometer. This extensometer consists of a thin strip of elastic, electrically conducting material which is cemented to the strained surface. The resistance of these strips changes by about 1 per cent when the strips are strained 0.1 per cent, which when the strips are applied to steel specimens corresponds to a stress of about 30,000 lb. per sq. in. Extensometers of this type have been developed by the Massachusetts Institute of Technology and at the Hamilton Standard Propeller Company. The change in resistance of the carbon strip results in a change in current flow in a circuit including a constant voltage source, and the current is passed through an amplifier to an oscillograph which makes a graphical record of it. This apparatus was used to study the compression wave that travels along a steel bar when it is struck at one end by another steel bar.

Ross Gunn, technical adviser and superintendent of the Mechanics and Electricity Division of the U. S. Naval Research Laboratory in Washington, described a new electrical micrometer and its use in mechanical measurements. The micrometer comprises a vacuum tube containing either two heated electrodes with a movable plate

form two legs of a Wheatstone bridge, the circuit arrangement being that shown by the diagram reproduced here-

with. The plates are mounted on a rod passing through the center of an elastic diaphragm forming one end of the tube. Any slight movement of the outer end of the rod throws the Wheatstone bridge out of balance, and an electrical indicator connected diagonally across the Wheatstone bridge indicates the out-of-balance condition.

One application of this instrument is as a direct-reading dynamometer or horsepower meter. The instrument here described is then combined with an ordinary wattmeter. Such a meter has two circuits and its indications are proportional to the product of the currents flowing in these two circuits. The vacuum tube then is mounted on the shaft transmitting the power and produces a current proportional to the deflection of the shaft over a certain length, which in turn is proportional to the torque on the shaft, and this current is sent through one coil of the wattmeter. An electrical tachometer, which produces a voltage directly proportional to the speed of its armature, is driven from the shaft transmitting the power, and the current produced by the tachometer is sent through the other coil of the wattmeter, which thus gives indications proportional to the product of speed and torque, that is, of the horsepower transmitted.

## Experiments on Fuel Jets

**S**OME results obtained in experiments on the influence of the density of the gaseous medium on the propagation of a jet of liquid injected into it were given in a note presented to the French Academy of Sciences by M. Roger Kling.

With the gas at atmospheric pressure the jet presents the appearance of a long spindle, and if the injection pressure is high there is a Mach wave at the tip. If the gaseous pressure is increased, the velocity of propagation of the tip of the jet decreases and the Mach wave disappears. At the same time there appear other, lateral waves whose number increases with the gaseous pressure. Those originating at the tip of the jet are spherical; the following ones have the characteristic appearance of Mach waves, which points to supersonic velocities. These latter waves are rectilinear at small gaseous pressures (below about 115 lb. per sq. in.) and curve toward the orifice at higher pressures, thereby giving evidence of the slowing down of the

projectiles which engender them.

Experiments carried out by injecting liquid into the gaseous mixtures of different densities (mixtures of nitrogen and hydrogen) showed that the form and the velocity of the jet depend solely on the density of the mixture. In the following tabulation the tip velocity  $V$  of the jet is given as a function of the mass density of the mixture at the constant pressure of 184 lb. per sq. in.

Moreover, the jet was found to have the same form and the same velocity in nitrogen at atmospheric pressure and in hydrogen at a pressure of 200 lb. per sq. in., these two having the same density.

From the foregoing the conclusion may be drawn that the internal constitution of the jet depends essentially on the inertia of the gaseous medium. If this is low, the liquid central core of the jet begins to brake up into globules only at a relatively great distance from the nozzle, outside the field of observation. If the injection pressure is sufficiently high to produce

	Pure Nitrogen					Pure Hydrogen
$P$ (metric units) .	0.0233	0.0189	0.0146	0.0103	0.00598	0.00166
$V$ (ft. per sec.) . .	282	328	522	683	860	1,050

**T**HE PROSPECTS of the use of safety fuels in spark-ignition aircraft engines were discussed by Frank C. Mock of the Bendix organization in a paper presented at the last S.A.E. national aircraft meeting.

The various safety fuels have from 3 to 7 per cent less heat value than gasoline, hence it is necessary to burn them as completely as possible. These safety fuels naturally are of low volatility, but their vaporization calls for only 7.5 per cent of the heat lost to the cylinder walls, and the heat in the burnt gases remaining in the cylinder is about half that required for the purpose. From this it would seem that getting proper engine operation with this fuel is chiefly a matter of experimental effort and of an intelligent appreciation of the conditions involved. Owing to the cooling effect of the vaporizing process with this safety fuel it should be possible to use materially larger pistons and exhaust valves than with gasoline, and 18 cylinders may suffice for engines which otherwise would require 24.

By injecting the fuel into the cylinder it is possible to obtain the heat necessary for vaporization and at the same time to provide adequate cooling for parts that normally tend to overheat. The fuel can be injected also

into the inlet manifold or into the supercharger.

As regards the work which still remains to be done before safety fuel can attain an active service status, the author said the refineries had done their share, as the fuel is now available; the accessory manufacturers had assumed their part of the responsibility, and satisfactory injection pumps and control devices may be purchased. Preliminary work on cylinder and engine adaptation has been done by independent laboratories, but this work can be completed only by the engine companies. After complete engines have passed the routine endurance dynamometer and fuel economy tests, flight experience must be accumulated.

## Have Safety Fuels a Future In Spark Ignition Aircraft?

Mr. Mock estimated that final development of the complete engine, by the engineering staff of one of our large engine companies, would require at least 2½ years, including nine months on the single-cylinder stand, another nine months on the first multi-cylinder form, and the remainder for the correction of details. The following flight-test program might consume one to one-and-a-half years, depending on how complete the laboratory tests had been. After this work had been all done, said the author, it would probably be found that the safety fuel equipment cost and weighed two to two-and-one-half times as much as the gasoline equipment which it displaces. The specific fuel consumption so far had been slightly higher than with gasoline. The author concluded by asking whether this was too high a price to pay for abolishing, or at least greatly diminishing, the potential fire risk.

## and Gaseous Medium Density

ject- supersonic velocities in the jet, the Mach wave appears only at the point of the jet.

When the density of the gaseous medium increases, the resistance opposed to the movement of the central core causes it to break up into droplets. Each droplet behaves like a small projectile, and if its velocity is greater than that of the local velocity of sound, it gives rise to a Mach wave.

The atomization is the more intense, and the waves are the more numerous the greater the inertia, that is to say, the higher the density of the gaseous mixture. The foregoing holds only for the core of the jet; the outer envelope consists of droplets which have lost their velocity and which probably were forced outward by droplets following them.—*La Technique Moderne*, September 15.

### Effect of Road Surfaces on Operating Costs

**A** RECENT publication of Iowa State College at Ames (Bulletin No. 143, Cost of Operating Rural-Mail-Carrier Motor Vehicles on Pavement, Gravel, and Earth, by R. A. Moyer and Robley Winfrey) gives voluminous data on operating costs on various types of road surface in Iowa and Indiana. It is figured that the average empty weight of the cars for which data were gathered was 2950 lb. and that the mail load varied between 50 and 375 lb. Gasoline costs were found to average 1.56 cents per mile on pavement, 2.59 cents per mile on gravel, and 3.14 cents per mile on earth. Fuel mileages averaged 15.02 per gallon on pavement, 13.04 on gravel, and 13.52 on earth. The aver-

age mileage per quart of oil was 264 on pavement, 159 on gravel, and 113 on earth. The item which was affected most by the character of the road surface was that of maintenance. The gasoline cost per mile was about 24 per cent higher in winter than in summer on paved and gravel roads, and about 40 per cent higher on earth roads.

Maintenance costs, of course, also were materially higher in winter than in summer. On the basis of an annual mileage of 15,000, the average cost of operating rural-mail-carrier automobiles figures out to 3.34 cents per mile on pavement, 4.19 cents per mile on gravel, and 4.54 cents per mile on earth roads.

### Diesel vs. Gasoline Buses

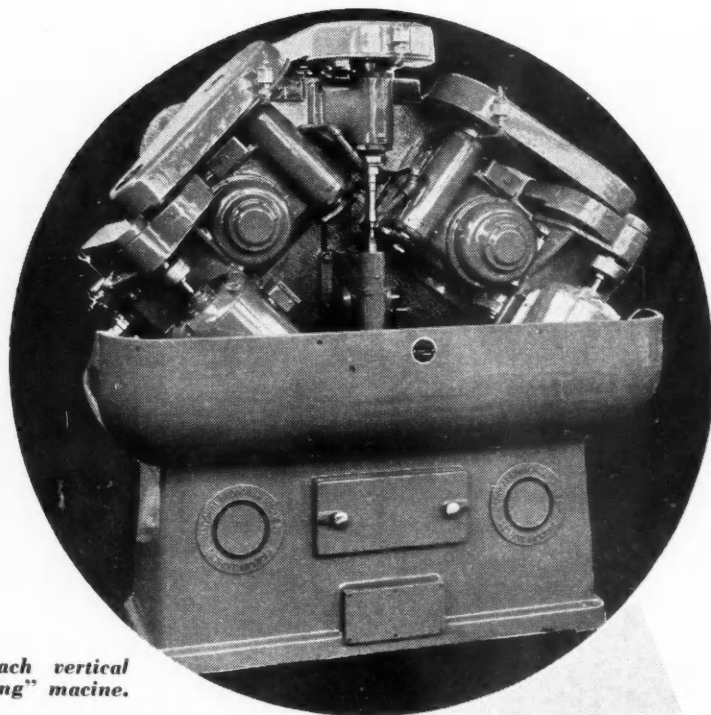
**C**OMPARATIVE operating and maintenance costs of gasoline- and Diesel-engined buses, based on figures supplied by 26 operating concerns, were given in a paper by W. C. Whalley of the Manchester (England) Corporation Transport Department, presented to the Institute of Petroleum. The broken-down cost figures were applied to two double deck (48-56-seat) buses, gasoline and Diesel, respectively, working under normal conditions and covering 45,000 miles per year each. There is not much difference between the first costs of the two vehicles which are £2100 and £2200, respectively. Non-variable costs (traffic expenses, general expenses, buildings and fixtures, machinery and tools, replacement fund, labor costs for fueling and lubricating, and license fees) are the same for both and amount to £1554 per bus per year. Repairs and maintenance figured to £250 per year for the gasoline and £265 for the Diesel bus; fuel consumption amounted to £525 and £271, and oil consumption to £11 and £15. Adding the figures for interest on loan, redemption of debt, and additional provision for renewals brings the total annual costs up to £2736 for the gasoline-engined and £2520 for the Diesel-engined bus, thus showing an advantage for the latter of £216 or 1.152 pence (1.92 cents) per bus-mile.

# MEN and MACHINES . . . .

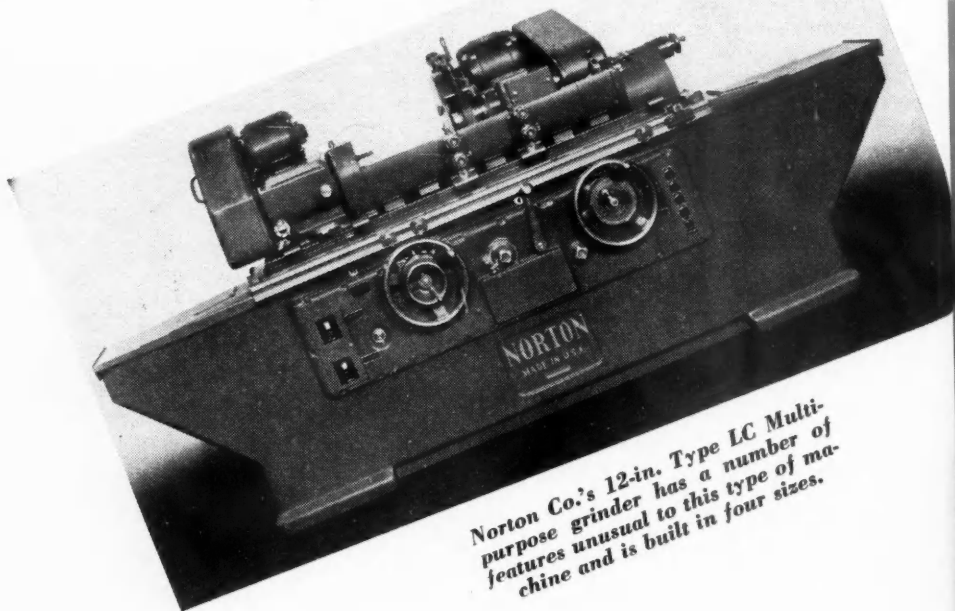
**T**HE BUSINESS BAROMETER, so far as the machine tool industry is concerned, is rising steadily, indicating very fair weather and increasingly brighter horizons. An index of operating rate prepared by the National Machine Tool Builders' Association for the year 1939, shows the industry at 91.2 per cent of capacity during November as compared to 84.9 per cent in October, and 52.5 per cent for January, 1939. Typical stories of smooth sailing are: the announcement that the Congress Tool & Die Co. has contracted for a new 20,000 sq. ft. plant in Detroit representing an investment of approximately \$150,000 for building and equipment; an 11,000 sq. ft. addition to the Ex-Cell-O Corp. plant also in Detroit; and, the occupancy of a new plant by the Van Keuren Co. of Watertown, Mass., which will provide the company with increased facilities for the production of its line of precision measuring tools.

One of the most interesting news items received by *Men and Machines* which shows which way the weathervane is pointing is the account of what transpired at the Warner & Swasey Co.'s annual sales conference held in Cleveland in mid-December. At the meeting, 21 salesmen for this turret lathe manufacturer, whose territories include the entire country, were asked a series of questions regarding the business picture.

Asked, "What is the outlook for business in general in your territory for the first quarter of 1940?", 16 answered, "Good"; five answered, "Fair." When questioned, "To the best of your judgment and observation, does the business now being done by manufacturing concerns in your territory reflect actual demand for and consumption of goods and products, or does it reflect to a considerable extent a build-up of inventory in the hands of manufacturers, dealers or retailers based upon hopes and expectations rather than actual demand and consumption?", all 21 of the salesmen replied in effect



*National Broach vertical type "Roto Shaving" machine.*



*Norton Co.'s 12-in. Type LC Multi-purpose grinder has a number of features unusual to this type of machine and is built in four sizes.*

that in their opinion today's business reflected actual demand and consumption. While it was noted that some manufacturers had covered future materials and supplies requirements, based on anticipated business, to some extent, general opinion was to the effect that,



## ***Men in the field see much more business ahead for the machine tool industry as a result of product consumption***

barring an unexpected or sudden falling off in business, manufacturers would not find themselves with unwanted inventory on their hands.

Commenting on this meeting, Charles J. Stilwell, president of Warner & Swasey, said: "While the replies to the questions submitted to our salesmen represent, of course, only personal opinions, we regard them as reasonably authentic, because these men, as sellers of machine tools, are in daily contact with a very wide range of manufacturing industries, and the machine tool requirements of the companies upon whom they call reflect inevitably the nature and the extent of the business now being done, and in prospect, in those companies.

"By far the most important conclusion to be drawn from these replies is that although business received a decided impetus from war abroad and defense at home, the major share of our present manufacturing activity is, in fact, founded upon actual current demand for and consumption of the goods and merchan-

dise designed to fulfill the normal peacetime needs of the American people."

**N**ORTON Co.'s new universal grinder known as the Type LC Multipurpose, has a number of features not usually found in a machine of this type. The table can be propelled hydraulically or, if desired, by hand through a two-speed arrangement, thus making it possible to move the table quickly into position, or more slowly for shoulder grinding and similar operations. When the power traverse is engaged, the hand traverse is disengaged, and vice versa. Moving a single lever disengages the rapid hand traverse and engages the slow traverse.

The wheel feed mechanism has two ranges of feed, either of which is selected by pushing in or pulling out a single knob. Each hole in the index is equivalent to a work diameter reduction of 0.0004 in. in the fast range and 0.0001 in. in the slow range. A stop is provided against which the handwheel can be located either for external grinding or internal grinding. An electric dwell control for the hydraulic traverse mechanism is supplied as part of the machine equipment.

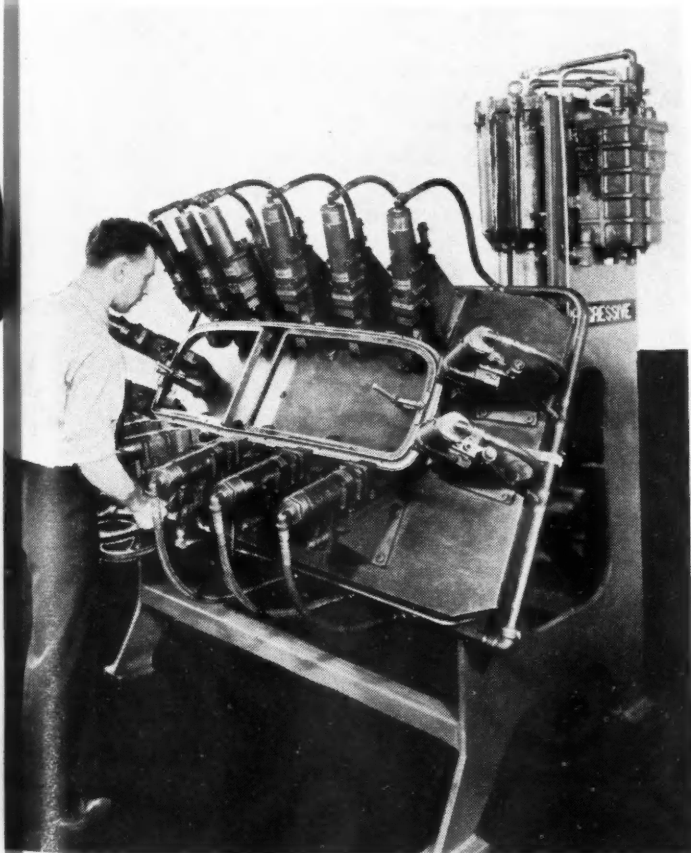
The headstock is of the universal type and is driven by either a ½-hp. constant speed A.C. or an adjustable speed D.C. motor. Cone type vee pulleys provide four work speeds ranging from 65 to 260 r.p.m. when an A.C. motor is supplied.

Both live spindle and dead center operations can be performed. The base is graduated and can be set at any desired angle either side of the zero or normal position. All bearings are pressure-lubricated by an impulse type pump driven from the jackshaft, and the final drive to the face plate is by chain.

The wheel slide can be swiveled to any desired angle and fed at that angle, or it can be set at any angle and fed perpendicularly to the table ways. By releasing a single binding screw, it is also possible to move the wheel unit proper backward or forward, thus increasing the distance between wheel and work centers by as much as six inches, if desired.

The Norton machine swings 12 in. and is built in 24-in., 36-in., 48-in., and 72-in. lengths.

**N**ATIONAL BROACH & MACHINE Co. is manufacturing its "Red Ring Roto Shaving Machines" in



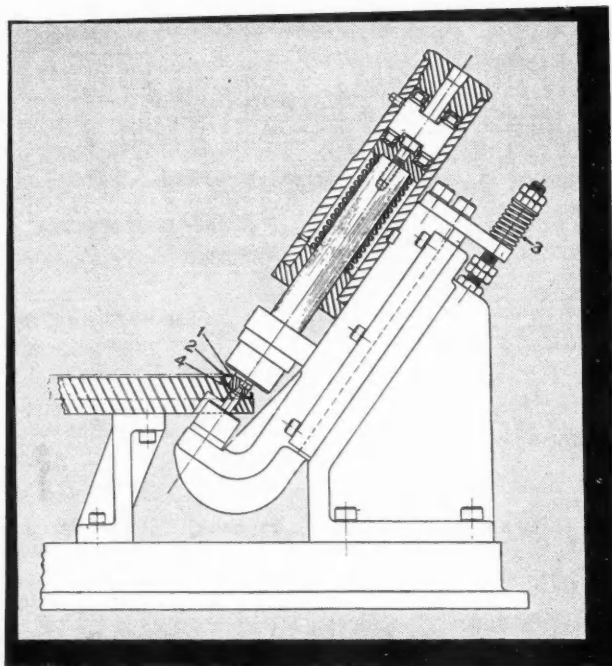
*Progressive Welder's new balanced-spring type punching units mounted in windshield garnish molding punching fixture.*

three types — vertical, horizontal and turret. The vertical type, which carries a single work spindle, is applicable to a wide range of work up to 10 in. in length and 4 in. O.D. It is said to be used very effectively on transmission main drive gears, bevel drive pinions and similar automotive parts.

The operation of the Roto Shaving machine is as follows: After a work unit is loaded, pressing the starting button begins the automatic ram cycle. Both cutter and slides advance quickly to cutting position, then feed at a selected rate until the cut is completed. A short dwell precedes the return of the cutter slides to their original position for unloading the work. This entire cycle takes only about 20 sec. The horizontal type machine functions in the same manner as the vertical type, but accommodates work units up to 24 in. in length and 4 in. O.D. It is especially adaptable to work units having long shafts. The turret type machine has a stationary base. The turret itself rotates about a vertical axis at a speed of one revolution every 28 sec. The turret has four faces, or panels, each of which accommodates one work unit.

"Roto Shaving" is a method of finishing circular, cylindrical and conical surfaces, especially those which are to become locating surfaces for subsequent machining operations. It attains high accuracy (tolerances usually under 0.001 in.), is fast and the finish produced is said to be smooth, gray in color and comparable to that resulting from green grinding. Stock removed ranges from 0.010 in. to 0.015 in. on plain flanged surfaces, or approximately 0.020 in. on the diameter of cylindrical parts. Plain flanged surfaces and cylindrical surfaces may be finished simultaneously. On parts, the surface hardness of which does not exceed 38 Rockwell, National Broach states that "Roto Shaving" is replacing green grinding because it accomplishes results equal to or better than grinding at a fraction of grinding cost. The method is claimed to be especially valuable for truing up locating surfaces on parts which subsequently require gear cutting operations.

Recent performance records of Red Ring machines include one in which surfaces were finished to a maximum tolerance of 0.001 in. both in concentricity and flatness. Cutter life, as determined on this job, was 4000 work pieces per grind. The grinding of these cutters is very simple, and 40 to 50 sharpenings are possible during the life of a cutter.



*Cross-sectional view of Progressive Welder's new hydraulic punching unit.*

piston moves toward the work, bringing a die into contact with the work and holding it against the nesting form. As the forward movement ceases, pressure increases within the cylinder, causing the cylinder to move away from the piston against spring pressure. To the cylinder of the unit is connected the punch and counterpunch, which, thus pierce the work from the far side.

In operation, hand clamps at each end of the nesting form position the work until the operator presses the starting button, which brings the die of each punching unit into contact with the work under low (90 lb.) hydraulic pressure. Immediately the dies contact the work, clamping it securely in the nesting form, the resulting back pressure trips the main pressure switch bringing the hydraulic booster into full action to complete the punching.

Reference to the accompanying diagram will show how the hydraulic pressure entering the cylinder brings the die (1)—also acting as work clamp—against the work (2) and completes the punching and counterpunching in a single stroke by means of the backward movement of the carriage on which the punching unit, and also the punch, are mounted. When the stroke is completed and pressure relieved, the stripping spring (3) retracts the punch from the work—the nesting form (4) acting as stripping plate. Following the return of the carriage to normal position, the piston spring moves the piston into original position, hand clamps are opened, work removed and the operation repeats.

Two such fixtures, similar in operation and employing identical and interchangeable punching units are already in operation one for windshield and one for rear window garnish moldings (see photograph on page 19).—H. E. B., Jr.

**W**ITH a new hydraulic punching unit, employing a balanced spring principle, a prominent manufacturer of windshield and window trim moldings is turning out every hour upwards of 200 moldings per fixture (one operator). The complete punching fixtures, designed and built by Progressive Welder Co., Detroit, comprise from 12 to 16 individual hydraulic punching units, a nesting form for the work, and an air-hydraulic booster to operate the punching units. Although these units are of simple single-acting construction, actual operation is in two directions. When hydraulic pressure is first admitted to the unit, the

# AUTOMOTIVE INDUSTRIES

*Just among Ourselves*

**W**HERE does American business stand at the beginning of 1940? One of the most interesting summaries of its general condition is being circulated by the Trundle Engineering Co. Arranged in the form of a conventional balance sheet, the Trundle summary shows that business enjoyed a Net Increase in assets during 1939, accompanied by a Net Decrease in liabilities.

The "pick assets" of business, the summary finds, are the greatest domestic markets in the world and foreign markets in a "highly interesting" condition. Bank deposits are high and interest rates are low. Inventories are low, too, and public business psychology reflect "renewed confidence" in the future of America.

The cost of the last war and the questionable character of profits from the present conflict are listed paradoxically as "fixed assets" because they will tend to keep us out of war. Other fixed assets found by Trundle are remembrance of the 1929 depression and the caution resulting from knowledge of the dangers of overexpansion. Ample plant facilities and increased volume based soundly on market research and better products are also listed among the assets, with unlimited natural resources in the wheel horse position just before the net increase which summarizes the assets.

Among the current liabilities of business are found the great temptation to cash in on the war and a mistaken overemphasis on the possibility of a war boom. This adds up to "regrets" as the Trundle balance sheet sees it. Dangerous failures to hold down profits, if accompanied by "fatal" profiteering would result in loss of volume, the balance sheet implies.

Management sins which may become current liabilities include failure to control costs, failure to coordinate organization, failure to study markets and lack of controls. These are stigmatized as serious, inexcusable, disastrous and slipshod, in the order listed. Their balance-sheet companion is "red ink."

Objection to adequate wages (short sighted) and disregard of the annual income needs of workers (obsoleto) lead to "trouble," on the Trundle ledger. The "capital account" includes such items as loans and credit policy (in status quo), interference with business (no worse), and the coming election. These factors on the liability side add up to "some hope" and give final justification to Trundle's view that there has been or will be a "net decrease" in the liability position of American business.

It's our view that very few of the liabilities named

here will be found concealed in the automobile manufacturing cosmos. To which we add the prediction that 1940 will see a 25 per cent increase in motor vehicle production over the 1939 figures.

## Multi-Cylinder Aircraft Engines

Mention of a 42-cylinder aircraft engine said to be under construction for the U. S. Army, at the recent annual meeting of the A.S.M.E. in Philadelphia, apparently stirred the popular imagination, and reporters sought to obtain additional information, but without success. An engine with such a large number of cylinders naturally should develop more power than any aircraft engine now in production (the largest number of cylinders for aircraft engines actually in production is 24), and presumably would make it possible for military planes to reach higher speeds than are now possible.

From the standpoint of reliability there is evidently little, if any, advantage in combining such a large number of cylinders in a single engine, for if a single valve or connecting-rod should break, or if a piston should seize, the entire engine would be put out of commission, whereas if the 42 cylinders were divided between three engines carried on the same plane, such an accident would incapacitate only one of the engines and the pilot could continue his flight on two. In military operations, however, speed is of predominant importance, and the chief advantage of an engine with as many as 42 cylinders would be that it would permit of higher flying speeds than, say, three 14-cylinder engines of the same piston displacement. The power developed would be substantially the same in both cases, and the advantage of the single engine would depend almost entirely on the fact that its forwardly-projected area would be much smaller and its drag, therefore, less. The logical arrangement for a 42-cylinder engine seemingly would be as a six-row radial. With the engine liquid-cooled, its forwardly-projected area actually would be less than that of a single two-row radial 14-cylinder air-cooled engine. A radiator probably would be required, although there has been some talk to the effect that by using high-boiling-point cooling liquids a radiator might be dispensed with in fast planes. In any case, because of the high temperatures to which these liquids may be raised and the high air speeds, the radiator required would be only very small and would not add materially to the drag.

—H. H., P. M. H.



# Gas Generators Capture

**I**N MOST European countries restrictions on the sale of gasoline since the outbreak of war have led to renewed interest in gas generators or gas producers for both passenger cars and motor trucks. In Sweden the A/B Volvo of Gothenburg, has developed a special generator for passenger cars, which is carried on a small one-wheel trailer attached to the rear bumper. This arrangement has the advantage that it obviates the need for unsightly equipment directly on the car, and that very few changes need to be made in the car itself to convert it from a gasoline-burning to a gas-burning vehicle. For the following details of the Volvo system we are indebted to O. Schjolin, chief engineer of Volvo's passenger-car division.

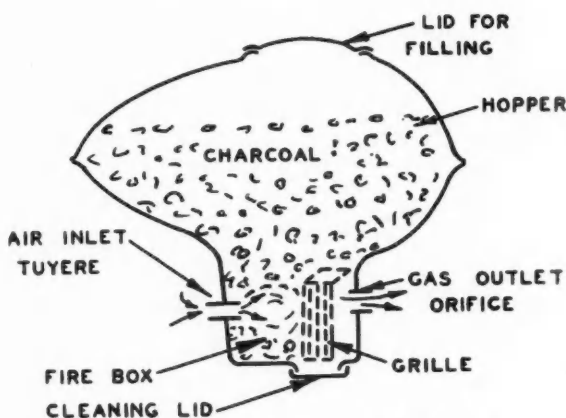
The generator has the appearance of a small "blimp" flanked by two supporting shrouds that extend down to a V-shaped frame. This frame is hitched to the rear bumper of the car; its members converge toward the rear, where it is supported by a single caster wheel.

The producer, which operates on charcoal, is built on the cross-draft principle. Air at high velocity is drawn into the fire zone through a horizontal nozzle or tuyère located at the rear and about halfway up the side of the firebox. In passing through the hot combustion zone, the oxygen of the air combines with the carbon of the charcoal to form carbon monoxide, which is the chief fuel constituent of the gas produced. This gas passes through a grill-shielded orifice on the opposite side from the air inlet and slightly lower than it. From there it passes successively through a primary cleaner located on the left, through the box-section frame members which serve as a cooler,

through a secondary cleaner or filter, and finally through a flexible hose which is snap-coupled to the main pipe leading to the car engine. At the engine it passes through a mixing valve which will be described in detail later.

The hopper and fire box are welded together to form a unit. The egg-shaped hopper, superimposed upon the fire box, is made of 1-mm. sheet steel. No refrac-

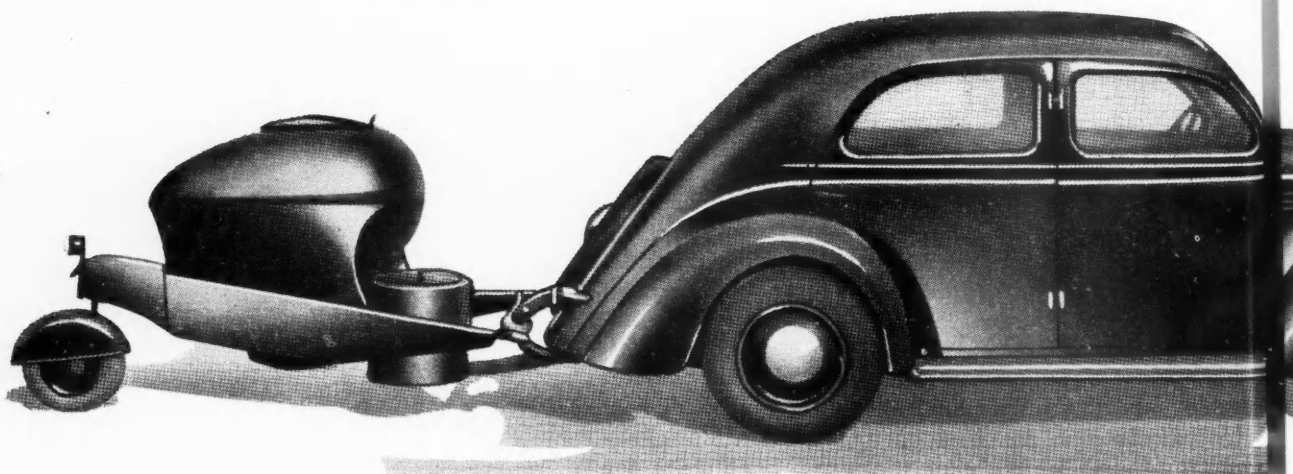
tory lining is used. On top of the hopper and on the bottom of the fire box there are lids that serve for charging and cleaning respectively. The grill shielding the gas outlet is a stamping of perforated steel which is placed vertically about 2 in. ahead of the outlet orifice. It is demountable for



*Diagrammatic section through gas producer*

quick replacement.

The air-inlet tuyère, which is water-cooled, comprises an inner and an outer steel tube, the two being welded together co-axially. The annular space thus formed is the water jacket, into which inlet and outlet tubes are welded. Water from a flat rectangular tank bolted to the right side of the hopper is circulated through the jacket by thermo-siphon action.



# e European Interest

## *Volvo design described in detail with a look at growing literature on the subject*

To the outer end of the tuyère a removable flame arrester is secured by a bayonet-type joint. It consists of a short tube containing a manually controlled butterfly-type shut-off valve and a brass flame quencher. The flame quencher, which is inserted into the outer end of the tube, is a spiral formed by rolling up a strip of corrugated and a strip of flat brass like a clock spring. The flat strip serves as a separator that prevents interlocking or meshing of the corrugations. This element prevents burning of residual gases at the air inlet when the engine is stopped.

As an additional precaution against backfiring during sustained engine shutdowns, the butterfly valve is closed to seal the gas within the generator and to prevent the entrance of air. When the fire is to be started in the generator the flame arrester must be removed.

The primary cleaner, also of sheet steel, is shaped like a frustrum of a cone with its axis vertical and its small end down. This cleaner, which is flange-mounted, is interposed between the fire box and the left frame member, and gas enters it tangentially about halfway up the side. Being constrained by the circular wall, the gas is forced into a cyclonic swirl. Centrifugal force throws all heavy particles against the wall, and they then drop by gravity into a collecting chamber at the bottom. Two conical baffles, through which the gas must pass before leaving the outlet tube on top, ensure additional refinement.

As mentioned previously, the gas then flows into the box-section passage of the left frame member, back to the apex of the "V," and then forward through the right member into

the secondary cleaner or filter. The large exposed area of the frame members insures ample cooling.

The secondary cleaner is an oval-shaped steel container placed parallel to the ground. It has a bellows-type cloth filter fitted co-axially over a perforated outlet tube. The filter, which is circular in section, lies

close to the top wall of the container. By virtue of the oval shape, a generous volume is formed underneath for collecting soot deposited on the filter, which is shaken down by road vibration.

Both cleaner units have quick-opening air-tight covers for cleaning. De-sooting is recommended about every 200-300 miles, depending on the quality of the charcoal used. With high-grade Beech charcoal of 12 per cent maximum water content, the cleaning interval can be increased to 400 miles.

Inserted in the flexible tube connecting the secondary cleaner to the main gas pipe of the car, is a conical screen. Should the filter be damaged, this screen clogs up and causes the engine to slow down, thereby giving a warning to the operator.

The gas enters the engine through a mixing valve which controls the air supply in proportion to the main throttle opening by means of a cam arrangement. If richer gas mixtures are required, the air throttle can be operated independently by a hand control.

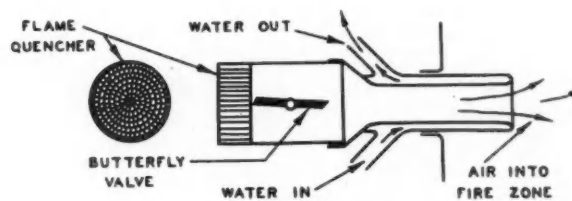
In the gas line just ahead of the mixing valve there

is an electrically operated suction fan, which is used only when the gas generator is being started. It creates a draft and pumps the gas to the engine. During the 3 to 4 minutes of the

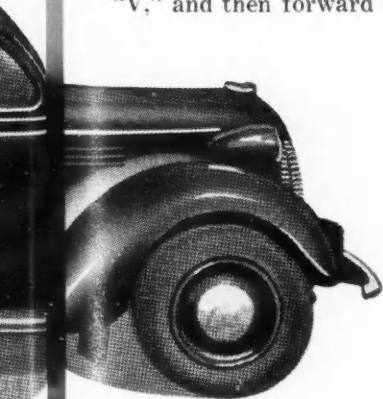
starting period, the gas is by-passed through a spring-loaded poppet valve contained in the housing of the air-mixing valve, into the engine exhaust line. This prevents the discharge of obnoxious gases under the hood.

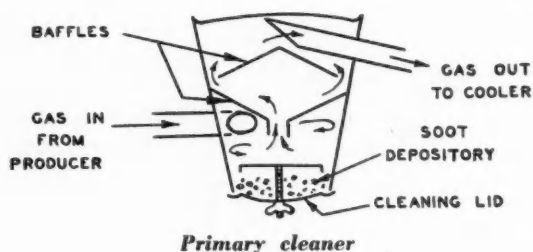
The by-pass valve, as well as the starting fan, is operated by the same wire as that used for hand control of the air-mixing valve. It is moved through a bell crank operating on a sector under the dash. By slightly over-running the closed position of the air valve, the by-pass valve is opened, and simultaneously electrical contact is made, which starts the fan. Subsequently, before the engine is started, the air valve is opened slightly. This movement closes the by-pass valve and stops the fan.

Volvo has provided this gas producer as an adapta-



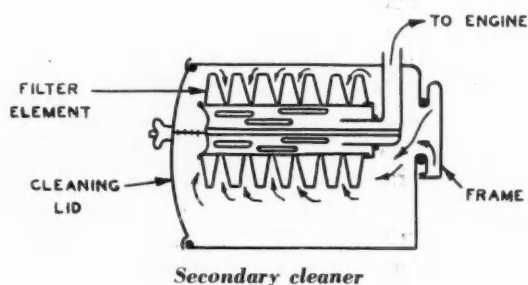
*Assembly of air-inlet tuyere*





tion to its stock engine and has kept intact all parts necessary for gasoline operation. Conversion to gasoline merely entails opening a petcock in the gasoline line at the carburetor. A hand-operated throttle is used for temporary runs on gasoline.

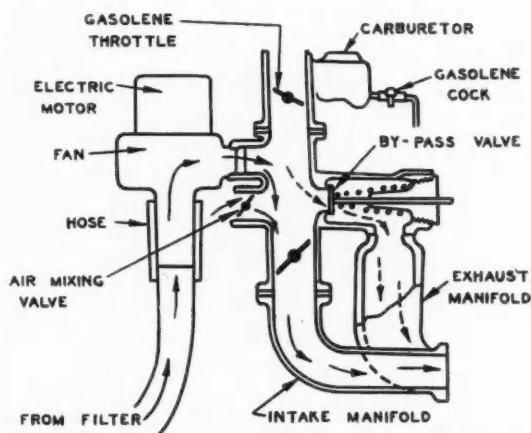
A recent relaxation in gasoline regulations, which permits 15 liters (4 gals.) per week per car owner, has prompted Volvo to modify its operating control. The car can now be started on gasoline



and then changed over to charcoal gas while in operation by a lever at the dash. This has eliminated the necessity of a starting fan and has simplified both construction and operation.

\* \* \*

Following is a list of recent books and articles on gas producers and producer-gas-operated motor vehicles:



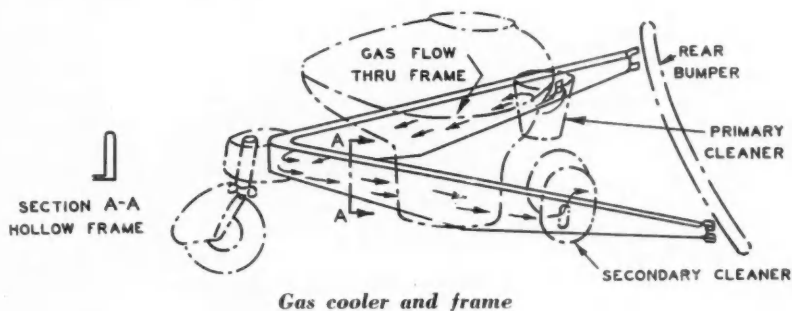
Diagrammatic assembly view of suction fan, gas mixer and carburetor

CARBURANT FORESTIER, ETUDE ECONOMIQUE ET GENERALE EN FRANCE ET DANS LE MONDE, by Bernard Mazodier and Edouard Neron. Dunod, Paris, 1939.

ERSATZ MOTOR FUELS, by G. Egloff, *Scientific American*, July, 1939.

HOLZGASGENERATOREN, 1937. Published by Julius Springer, Vienna.

KOELA GAS PRODUCER FOR ROAD VEHICLES, *Engineering*, May 26, 1939.

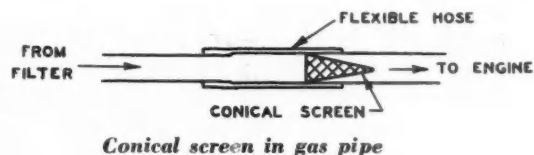


L'EMPLOI DU GAZ DES FORETS COMME CARBURANT DE REMPLACEMENT, by G. Coupan, *Génie Civil*, Nov. 19 and 26, 1938.

LES NOUVELLES AUTOMOTRICES A GAZ DES FORETS DE LA SOCIETE NATIONALE DES CHEMINS DE FER FRANCAIS, *Génie Civil*, July 16, 1938.

MODERN PORTABLE GAS PRODUCER, B. Goldman and N. C. Jones, *The Engineer*, Dec. 23 and 30, 1938.

MOTOR FUEL ECONOMY OF EUROPE, by G. Egloff, *Oil and Gas Journal*, Sept. 8, 1938.



PRESENT POSITION IN THE DEVELOPMENT OF PRODUCER GAS PROPULSION FOR ROAD TRANSPORT IN GREAT BRITAIN AND ON THE CONTINENT, by H. L. Pirie, *The Engineer*, March 31, 1939.

PRODUCER AND OTHER GAS VEHICLES AT OLYMPIA, *The Automobile Engineer*, December, 1937.

PRODUCER-GAS VEHICLES. *Automotive Industries*, July 10, 1937.

PRODUCER GAS: TWO SIMPLE AND EFFECTIVE BRITISH-MADE PLANTS FOR ROAD VEHICLES. *The Automobile Engineer*, November, 1936.

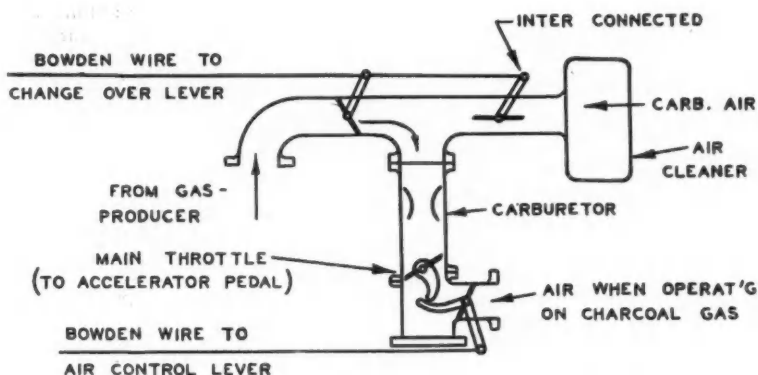
SOLID FUEL FOR MOTOR TRANSPORT, by G. E. Foxwell, *Engineering*, Sept. 9, 1938.

THE PRODUCER-GAS ROAD VEHICLE, by W. H. Fowke, *The Engineer*, April 7, 1939.

TEST OF GAS PRODUCER FOR A 4-5-TON LORRY, *Engineering*, Vol. CXLII p.

UNTERSUCHUNG AN FAHRZEUG GASERZEUGERN UND REINIGUNGSANLAGEN, bei H. Finkbeiner, *VDI Zeit-*





Control arrangement for alternate operation on gasoline and gas

*schrift*, July 9, 1938.

VERGASUNG VON ANTHRAZIT UND STEINKOHLKOKSEN IM FAHRZEUGGASERZEUGER, by K. Lang, *VDI Zeitschrift*, April 22, 1939.

VERSUCHE MIT KLEINSCHLEPPERN IM HOLZGASBETRIEB, *VDI Zeitschrift*, Jan. 15, 1938.

WOOD AND CHARCOAL AS MOTOR FUELS, by G. H. Donald, *Engineering*, Sept. 2, 1938.

WOOD GAS GAINS: EUROPE'S MOTOR FUEL SUBSTITUTE, *Business Week*, Nov. 27, 1937.

## PRODUCTION LINES . . . .

### Tractor Giants

Prospects of a major boom in agricultural tractor business for 1940 are pictured in an article in *Ethyl News* for November, 1939. The "baby" tractors are visualized as tapping a new reservoir of some three million small farms, a market that did not exist in 1937. Dollar volume of the tractor industry is seen as starting from 700 to 800 million dollars and heading to a possible billion-dollar annual average. Surely this is bright news not only for the primary producers but for the hundreds of parts and accessory manufacturers who supply them.

### No Limit

Prominent industrial gear unit producer told us recently of experimental work in progress leading to relatively high gear tooth unit loading, many times conventional practice. This would have been unheard of only a few years ago. Today, the prospect is accepted as a rational problem since it offers such great possibilities of increasingly higher ratings with relatively small, and less expensive, gear boxes. In the background, the successful solution of the problem relies upon the now available high grade alloy steels, improved gear cutting techniques, an improved method of gear grinding, better surface finishes and lubrication.

### By Competition

One of the surest ways to achieve progress in design or fabrication economy is along the path offered by competitive methods or materials. Striking example of this is found in the production of wheel hubs. Here on the one hand is an induction hardening process which hardens wearing surfaces selectively and locally—on the other hand is the Airco flame-hardening

process which hardens selectively with the torch. Two entirely different processes, yet they offer similar economy, permit the design and production of wheel hubs without separate bearing retainers or raceways.

### Remote Control

A clever push-pull cable and casing mechanism with suitable fittings has found wide application for various remote control problems. For example, several motor truck builders have adopted this scheme for accelerator pedal operation on cab-over-engine jobs. Others have utilized the same idea in working out a practical hook-up for shifting two-speed axles. However, the widest application seems to lie in various industrial control problems—the operation of machine tools, press die operation, etc.—in places where a mechanical linkage with levers and bell-cranks and rods is not feasible.

### Induced Heat

Subtly, as such things usually go, the manifold applications of rapid and selective heating by high frequency induction devices have become widespread in many ingenious forms. The development started on a large scale with the drying of sheet metal parts and complete bodies in Chrysler Corp paint shops. About the same time we began to note the adoption of Tocco hardening for crankshafts—more recently extended to camshafts and small parts. Induction heating has brought about an almost revolutionary change in fly-wheel assembly practice, eliminating the oftentimes radical treatment of heating flywheels in an oven. Now comes the Budd induction process for heat treating, making possible the hardening of the inside diameter of long cylinder liners of inner surfaces of wheel hubs to eliminate the use of bearing races. Seemingly there is no end to the useful applications of this versatile utilization of electrical energy.—J. G.

## Fuel to Performance Relation in Diesels

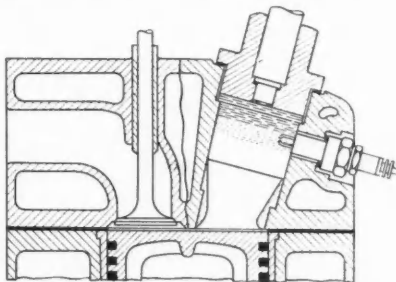
**W.** S. MOUNT and G. A. Hope of Socony-Vacuum Oil Co., Inc., in an S.A.E. paper on the "Relation of Diesel-Fuel Properties to Their Engine Performance" came to the conclusion that the fuels used in Diesel engines must have a sufficiently high cetane number to prevent misfiring and engine roughness, but that the use of fuels of still higher cetane number is unwarranted, because the possible gains do not compensate for the higher costs. When the fuel used has a cetane number 10 units higher than the minimum which will give freedom from misfiring, there is a noticeable improvement in the smoothness of combustion. Combustion knock in Diesel engines finds its origin in the lighter unsupported metal parts such as the valve-chamber cover plate, the side cover plates, and the oil sump. On low-quality fuel engines run most satisfactorily under conditions which ensure high combustion-chamber temperatures, such as heavy load, high speed, high jacket temperature, and high air temperature. When running at high speeds under light loads the ignition delay is excessively long, and when slowing down from such speeds without change in the throttle setting, combustion will be incomplete and the exhaust smoky. Other conditions being the same, Diesel engines with compression ratios above normal will have the most satisfactory combustion control (rate of combustion). Trying to compensate for poor ignition quality by varying the injection timing is an expedient that is too dangerous to entrust the average operator with.

### Flat Co. Introduces Multi-Fuel Engine

**A** FUEL-INJECTION, spark-ignition, multi-fuel (gas, oil and alcohol) engine has been developed in Italy by the Fiat company. A characteristic of this engine which distinguishes it from others of the same general type is that a full charge of air is admitted regardless of the load, which improves the part-load efficiency. As shown by the accompanying sectional view, the combustion chamber is in the form of a small cylinder in the cylinder head, with its axis making a small angle with the axis of the engine cylinder. It communicates with the working cylinder through a venturi-like passage.

Owing to the position of the combustion chamber, at the end of the suction stroke it is practically filled with burnt gases at the same pressure as

the cylinder proper. During the compression stroke the burnt gases are forced toward the top of the combustion chamber, and they are followed up



Combustion chamber of Fiat engine

by fresh air from the cylinder. A compression ratio of 7.2 being used, at the end of the compression stroke the dead gases occupy about one-seventh of the total combustion-chamber volume.

Before the end of the compression stroke, fuel is injected into the com-

bustion chamber in the direction of its axis. The fuel jet meets the rising column of air and forms a combustible mixture that forms a more or less stratified layer below the layer of dead gases. The spark plug is located near the upper end of the combustible-mixture zone, and ignition takes place as is an ordinary gasoline engine. It will be noticed that no attempt is made to effect a thorough mixture of the fuel with the whole of the air charge by turbulence or similar means. Since a full charge of air is admitted at all loads, the upper end of the combustible-mixture zone is always at the same location, and the spark points are always surrounded by this mixture. At low loads there is claimed to be good stratification of the combustion-chamber contents, the layer of dead gases at the top being followed by a thin layer of combustible mixture, while the entire lower portion of the chamber is filled with air.

A performance curve of the engine running on gas oil shows a practically constant b.m.e.p. of 89 lb. per sq. in. from 800 to 1400 r.p.m., with a decrease at higher speeds, and a specific fuel consumption rising from 0.47 lb. per hp.-hr. at 800 r.p.m. to 0.52 per hp.-hr. at 1600 r.p.m. This is for full load. At one-third load the specific fuel consumption is 19 per cent greater than at full load, as compared with 58 per cent in a carburetor engine.—*The Automobile Engineer*, October.

## Hercules Adds 2-Cylinder Gasoline Engine to Line

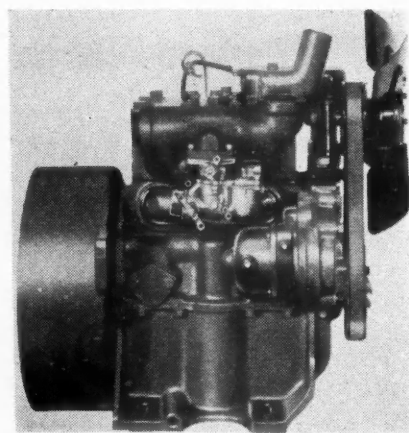
**H**ERCULES MOTORS CORPORATION has added a smaller, two-cylinder, heavy-duty gasoline engine and power unit, the Model BXB of 2½ in. bore and 3 in. stroke (39 cu. in. displacement). Its maximum torque is 28 lb.-ft at 1200 r.p.m. For continuous peak-load service the engine can be operated at up to 1800 r.p.m., at which speed it develops 9.2 hp.

Although thermo-siphon cooling is standard practice on these engines, water-cooling pumps are available. Up-draft manifolds of either the center-or rear-up outlet type can be furnished. The No. 6 S.A.E. bellhousing is furnished as standard equipment, but No. 5 size can be furnished on request.

The crankcase is cast integral with the cylinder block and carries the two main bearings, which are of 2-in. diameter and 1¼ and 1½ in. long (front and rear, respectively). Connecting-rod bearings are of 1½ in. diameter and 1 in. long, the connecting rod having a center-to-center length of 5½ in. Cylinders are of the L-head type and

valves have 30-deg. seats. The crankshaft is counterbalanced to compensate for all of the rotating unbalanced, and 45 per cent of the reciprocating weight.

A large number of parts are interchangeable with the same parts of the ZX series of four-cylinder engines.



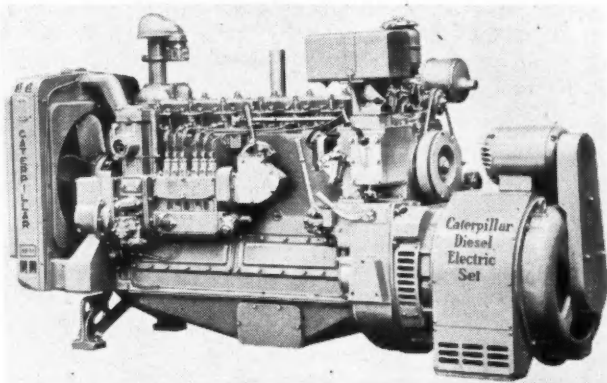
Hercules Model BXB gasoline engine

## Caterpillar Generator Can Be Set Up Quickly

**C**ATERPILLAR TRACTOR CO., Peoria, Ill., has added a 30 kw. size (Model 46-30) to its line of Diesel-electric sets. The set includes a six-cylinder Diesel engine, a generator and all the necessary electrical equipment with the exception of the circuit breaker. Less

rods and other parts and accessories are interchangeable with the corresponding parts and accessories of the Mack truck engine. The six cylinders of both "Mariner" engines have a bore of 4 3/8 in., a stroke of 5 3/4 in., and a displacement of 519 cu. in. At 1000

Caterpillar 30-kw. generator set, requiring only one hour for installation



than an hour is said to be required to install the set ready for operation.

The new set is particularly adapted for operating power air-conditioning machinery in hotels, theaters, and similar establishments; as a standby unit for airports, and as the source of current for camps, carnivals, factories, ice plants, mines and quarries.

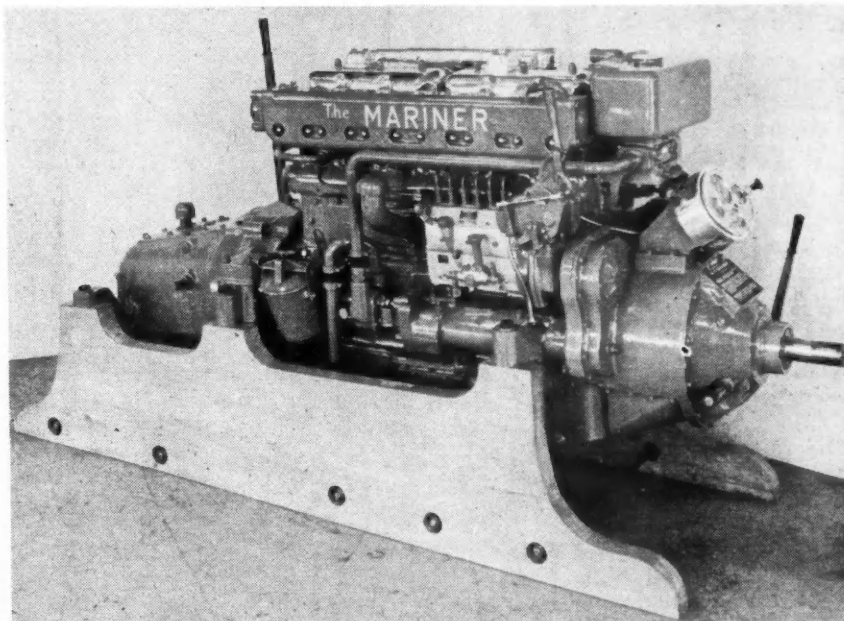
None of the three operating adjustments of the engine affects the Diesel fuel system. The generator is of single-unit construction and is equipped with ball bearings. It is claimed that the voltage-control system is such that the set can pick up large motor loads without excessive drop in voltage and light flicker.

### Two Marine Diesels Developed by Mack

**M**ACK TRUCKS, INC., has developed two Diesel marine engines based upon its six-cylinder Lanova-type truck engine. The workboat unit, Model W, has a power takeoff at the forward end for winch or pumping operations. It is rated 100 hp. at 1800 r.p.m., and weighs 2750 lb. Model Y, for power cruisers, small yachts, and auxiliary purposes, is rated 120 hp. at 1800 r.p.m., and weighs 2400 lb.

Cylinder block, crankcase, crankshaft, camshaft, pistons, connecting

(Right) Mack "Mariner" marine engine with power take-off at the forward and a reduction and reverse gear at the rear end



ulated pressure of 55 lb. per sq. in. The lubricating oil is water-cooled. Oil and air filters are built into the engine. All oil leads are drilled in the solid iron.

The standard generator is a 32-volt unit and has a capacity of 175 watts. However, generators of other voltage and also of larger output are available. Joe's reduction gear with full-speed reverse is provided. The engine, with its 32-volt starter, can be readily arranged for remote control from the wheelhouse. The instrument panel carries a tachometer, oil-pressure gage, oil-temperature gage, fuel-pressure indicator, water thermometer and ammeter.

These engines are available for either right- or left-hand rotation.

### Stiffness of Rubber Engine Mountings

**R**UBBER is now used very extensively for engine mountings, and the design of such mountings was discussed in considerable detail in an I.A.E. paper by Cedric E. Iliffe printed in *The Journal of The Institution of Automobile Engineers* for December. Mr. Iliffe also gives a formula for the stiffness of such mountings which has been developed from a formula by Dr. Konrad Oeser of Berlin. For a solid cylinder of rubber of Shore hardness  $H$ , height  $h$  in., and diameter  $d$  in., the equation for stiffness in compression is

$$C = 6.17 d H^{1.75} / (h/d)^{1.1} \text{ lb. per ft.}$$

Mr. Iliffe says he has found this equation to be extremely reliable, and it can be readily applied also to hollow cylinders, rectangular blocks, etc., by calculating the diameter of a solid cylinder of equivalent cross section in each case. In Dr. Oeser's original formula corrections were made for lateral expansion and volume, but these corrections, Mr. Iliffe says, are small for normal loads, and even zero for shear strains, and can be omitted.



# Atwood Constant-Pressure Clutch

**T**HE ATWOOD constant-pressure clutch is a new, hand-operated clutch for use on tractors and power take-offs, which is being marketed by the Auburn Mfg. Co., a subsidiary of the Atwood Vacuum Machine Company. Referring to the sectional view, Fig. 1, *I* is one of a number of double spring washers which are subjected to a predetermined load between pressure plate *L* and pressure ring *M* with spacers *K*. When the clutch is engaged, pressure ring *M* moves forward and away from the shoulder of spacer *K*,

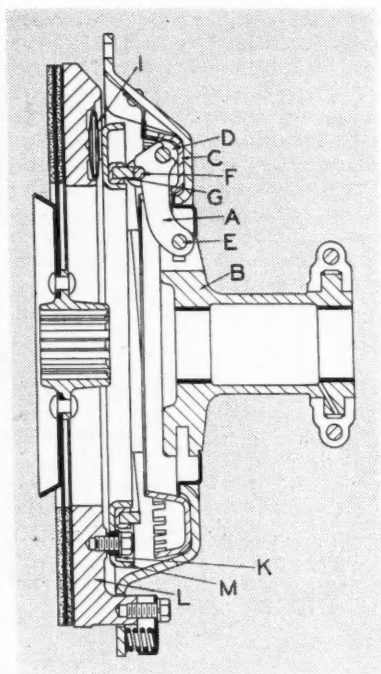


Fig. 1—Sectional view of Atwood constant-pressure clutch.

thereby further compressing spring *I*. The advantage claimed for this construction is that it provides a wear-compensating action.

When the clutch is engaged by moving sleeve *B* to the left, the actuating levers *A* pivot around cam shoe *F*, and roller *D* rolls inward on adjusting ring *C* to a position slightly past the center, in which position it locks itself. Pressure ring *M* is thereby moved 0.1 in. toward the pressure plate. With a properly adjusted clutch this motion is sufficient to take up the running clearance between pressure plate and driven plate and to separate the pressure ring 0.06 in. from the shoulder of the spacer. Therefore, as the facing of the driven plate wears down, spring *I* will continuously compensate for the wear, until the pressure ring is again back against the shoulder of the spacer, that is, after 0.06 in. facing wear.

If it were possible to devise a spring that had a zero

rate for a compression range of 0.06 in., the pressure on the driven plate, and therefore the torque capacity of the clutch, would remain constant while the facing wore down 0.06 in. The "Belleville" spring used in the clutch is claimed to have very nearly this characteristic. Fig. 2 shows a pressure-deflection curve of two Belleville washers assembled over a spacer ring. In the assembled condition, under a load of 225 lb. this spring is 0.185 in. high (point A), and it requires only an increase to 245 lb. to compress it to 0.125 in. With this type of spring, therefore, it is possible to get an almost flat curve over a working range of 0.06 in.

Since the torque capacity of a clutch is directly proportional to the pressure applied to the driven plate, the loss in torque capacity due to facing wear, on a percentage basis, is the same as the loss in spring pressure, and in this case amounts to only about 8 per cent for a facing wear of 0.06 in. As clutches of this type usually are designed with a torque safety factor of at least 2, it is evident that the facing can wear close to 0.06 in. before a field adjustment needs to be made.

Adjustment of the clutch is made by turning adjusting ring *C* with a screw driver inserted through one of the holes in the back plate. This ring is interlocked with the actuating levers and release sleeve, and when turned, moves cam shoe *F* up or down the incline on cam *G*. The adjusting ring is held from rotating by a lock spring of double cantilever design, formed to snap in between the teeth of the adjusting ring, and so spaced that when one arm is between the teeth holding the adjusting ring from turning, the other one is riding on top of the next tooth. This provides a very fine adjustment as well as an added safety feature.

These clutches are manufactured in sizes from 8 to 18 in. diameter, and with slip-torque capacities ranging from 195 to 1520 lb.-ft.

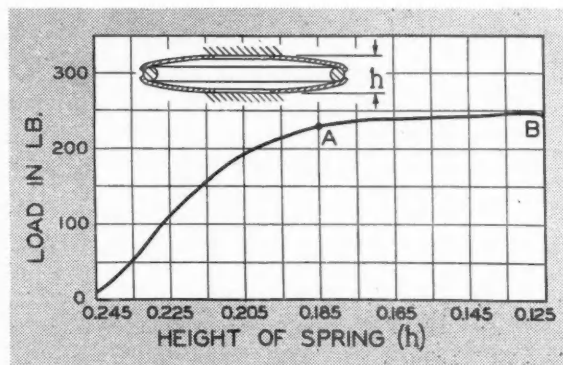


Fig. 2—Load deflection curve of Belleville spring assembly

# SINGER FOUR-CYLINDER

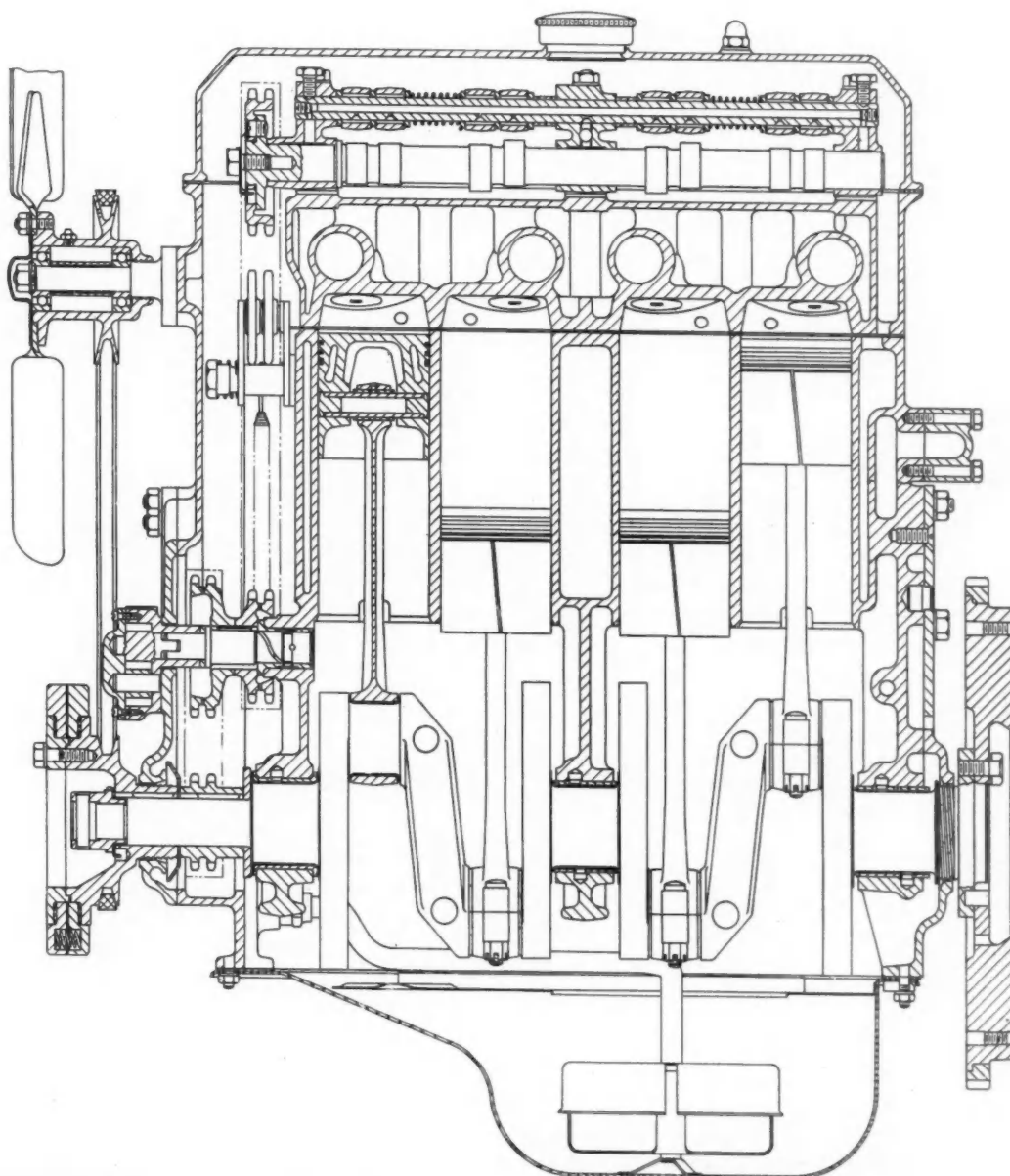
## 12 Hp. ENGINE

### *Longitudinal Section*

One of three models termed 9 hp., 10 hp., and 12 hp., all with an overhead camshaft, the Singer Twelve engine has a power output somewhat above the average of its size and class, for the four-five passenger car to which it is fitted is essentially a "family" type of moderate price making no pretense to a sports car

performance. With a bore and stroke of 68 x 105 m.m. (approximately  $2\frac{11}{16} \times 4\frac{1}{8}$  in.) and a piston displacement of 1525 c.c. (93 cu. in.) it develops 44 b.hp. at 4000 r.p.m. and has a b.m.e.p. of 112 lb. per sq. in. at 2600 r.p.m. The compression ratio is 6.2 to 1.

The overhead camshaft is driven by duplex roller



## SINGER FOUR-CYLINDER 12 Hp. ENGINE

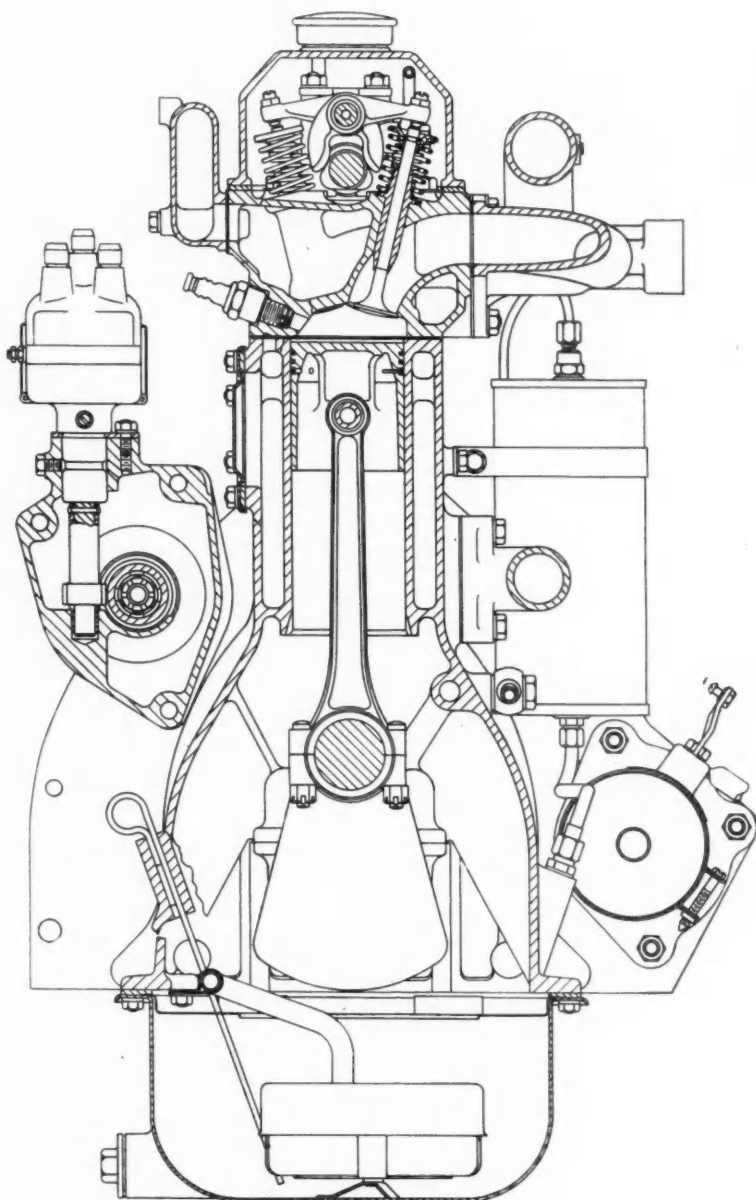
### *Transverse Section*

chains, the two-to-one reduction being made in two stages; a short primary reduction chain is triangulated to drive a layshaft at L-head camshaft height and a side shaft to operate the generator and ignition distributor, the latter indirectly through helical gears on the side shaft. From the layshaft a longer secondary reduction chain, tensioned by a spring-loaded idler sprocket, drives the overhead camshaft. The layshaft, at approximately two-thirds crankshaft speed, drives the gear type oil pump through a dog coupling at its front end. The camshaft has three bearings integral with the cast iron head. Oil for the end bearings and valve rockers is conveyed through a drilled rocker shaft from the center bearing of the camshaft.

Cylinder block and crankcase as a unit are in chrome cast iron. Water jackets extend over the full length of the cylinder bores; circulation is by thermo siphonic action.

The three-bearing crankshaft is counterbalanced and is unique in British practice, so far as four-cylinder engines are concerned, in having torsional vibration damper; located at the front end, the two-piece driving unit carries two spring-separated disks with fabric friction facings in a rectangular groove.

Front and rear crankshaft journals have oil return grooves and throwers. Crankshaft journals are of  $1\frac{15}{16}$  in. diameter and have a total bearing area of 26.8 sq. in.; white metal steel-backed liners are used. Crank pins are of  $1\frac{11}{16}$  in. diameter and  $1\frac{1}{2}$  in. wide; white-metal liners are cast in the big-ends. Pistons are of the B.H.B. split-skirt type in aluminum alloy (R R 53) with two pressure rings and one scraper. Floating wrist pins have bronze bushings in the small ends. Lubrication, with internal and external filters, is by pressure through-



out except to the wrist pins. Electric equipment is Lucas 12-volt, ignition timing by centrifugal control.

The weight of this engine charged with oil (11 pints) is 318 lb.



## NEWS OF THE INDUSTRY

### SAE Announces Program For Its Annual Meeting

The Society of Automotive Engineers has announced a tentative program for its annual meeting to be held Jan. 15-19 at the Book-Cadillac Hotel, Detroit, Mich. William L. Batt, president of SKF Industries, Inc., and vice-chairman of the SAE Business Advisory Council, will be the principal speaker at a banquet to be held Jan. 18. Title of Mr. Batt's address will be "What's Ahead for Management."

In addition to demonstrations of recent developments in light and lighting by L. C. Kent, General Electric Institute, for the Junior-Student session and a symposium on detonation performance on the road, the program lists 31 technical papers scheduled for presentation during the five-day meeting.

The papers and authors are as follows: "Engine Deposits and the Effect of Some Fuel Additives", J. A. Moller, Pure Oil Co.; "Aluminum Aircraft Fuel Tanks", E. H. Dix, Jr., and Dr. R. B. Mears, Aluminum Co. of America; "Rudder Control Problems on Four-Engine Airplanes", Clarence L. Johnson, Lockheed Aircraft Corp.; "Observations on the Cranking of Diesel Engines", L. E. Lighton and H. C. Riggs, Electric Storage Battery Co.; "Air Forces on Radial Air-Cooled Engine Cowling as Determined from Pressure Distribution Tests", R. R. Higginbotham, Republic Aviation Corp.; "The Correlation of Wind Tunnel and Flight Test Results", W. W. Symington, Jr., The Glenn L. Martin Co.; "Instrumentation and Its Effect on Motor Vehicle Maintenance", Errol J. Gay, Ethyl Gasoline Corp.; "Why a Ceramic Spark Plug in Aviation?", A. L. Beall, Wright Aeronautical Corp.; "The Shortcomings of Mica as an Insulator Material in Aviation Spark Plugs", Val Cronstedt, Pratt & Whitney Aircraft Div., United Aircraft

(Turn to page 37, please)

### Shell Oil Co. Establishes Aviation Scholarship Fund

Establishment of a \$15,000 scholarship and award fund, for which more than 9000 student aviators in 400 American colleges will be eligible to compete, has been announced by Major Lester D. Gardner, executive secretary of the Institute of Aeronautical Sciences.

The fund, established by Shell Oil Co. to provide the Shell Intercollegiate Aviation Scholarships for student pilots, and the Shell Aviation Awards for colleges and flight schools participating in the Civil Aeronautics Authority's civilian pilot training program, will be administered by the Institute.

### Medalist

Lester M. Goldsmith of Philadelphia, chief engineer of the Atlantic Refining Co. (left), receives the Melville Medal from Harte Cooke, chairman of the Board of Honors and Awards of the American Society of Mechanical Engineers. Messrs. Goldsmith and Cooke are also members of the Society of Automotive Engineers.



Acme

## Court Decision Releases \$2,000,000 Loan to Reo

### Reorganized Company Will Resume Production of Trucks and Buses Under New Name and Management

Resumption of truck and bus production at Reo Motor Car Co. was expected at an early date following approval of the company's reorganization plan by the U. S. District Court in Detroit on Dec. 12 after a majority of stockholders also had approved the reorganization which had been under litigation since December 1938.

Under instructions from the Court a meeting of stockholders will be held near the first of the year to complete the reorganization which calls for a change in the company's name, formation of a new company and naming of a new board of directors. The plan calls for management of the company by a three-man voting trust and it is expected that the new directors will total seven, at least one of whom will be a member of the voting trust. Approval of the plan made available a six-year loan of \$2,000,000 from the Reconstruction Finance Corp. and the voting trust will remain in effect during the period of the loan.

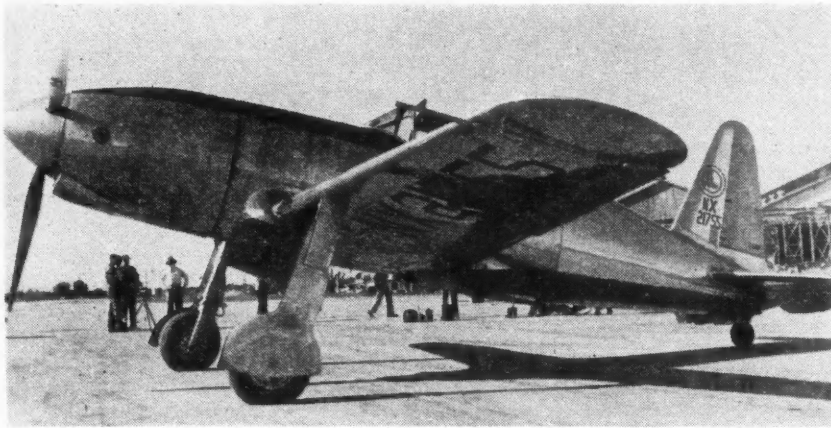
Theodore I. Fry, trustee, advised the Court that upon approval of the reorganization plan, all creditors with claims of less than \$500 were paid, as were taxes, while creditors with claims in excess of that amount are to be paid as rapidly as possible from the sale of assets, largely machinery, segregated for that purpose. Members of the vot-

ing trust named by the Court are: John W. Miner, Jackson, Mich., banker; George B. Judson, Detroit, banker; and Otto C. Seyferth, president of Western Michigan Steel Foundry Co., Muskegon.

Under present plans the company will place five truck models on the market ranging in capacity from one and one half to six tons, on three standard wheelbases. Prices are to be announced as soon as available. According to Frank Morgan, sales manager, the company's domestic dealer organization has remained 85 per cent intact while the export organization has remained 100 per cent intact. The company expects to operate 14 branches in the U. S., one in Canada and one in London.

### N.Y.U. Offers Courses in Industrial Radiography

New York University has scheduled three courses in industrial radiography as part of the science program of its Division of General Education. Herbert R. Isenburger, president of the St. John X-Ray Services, has been placed in charge of the new courses which are scheduled to begin Feb. 1. Mr. Isenburger, who was born and educated in Germany, has been for many years associated with Dr. Ancel St. John, pioneer in the industrial use of X-rays.



Acme

### Speed, 400 m.p.h.—Range, 1000 mi.

This single engined pursuit plane, known as the "Vanguard," is said to be one of the fastest single-engined planes produced on a commercial basis. The plane is capable of 400 m.p.h. and has a range of 1000 mi. It is being built by the Vultee Aircraft Co. in Southern California.

The ship has an air-cooled engine with the propeller set out in front on a long shaft in order to get a streamlined nose. Landing gear retracts to give the plane complete streamlining.

## First-Quarter Outlook for Steel Mills—80% Capacity

### *Automotive Buying Expected to Exert More of An Influence Than It Has in Past Few Months*

Automobile manufacturers and parts makers look forward to a period of normal routine conditions in the steel market during the new year's first two months. Automotive consumption is expected to exert more of an influence than it has in the last few months when, because of their long-continued absence from the market, much more was made of the buying of minor steel-consuming industries than the tonnages involved justified.

An average ingot production rate of 80 per cent during the next quarter is predicted by many. Although there has been some easing off in the pressure on mills in the Detroit area, activity there continues to reflect the high rate of automobile production, virtually all of the steel mills' output being earmarked for nearby assemblies and no reserves being built up.

Makers of ferrochromium have advanced their prices about 5 per cent following a \$5 per ton rise in the price of imported chrome ore. Minor price adjustments in certain chromium alloy steels would, therefore, seem to overhang the market.

Marking up of the maximum price of electrolytic copper by the British Government from the equivalent of 10.91 cents to 11½ cents had no effect on New York market, producers' quotation remaining at 12½ cents, with offerings in the open market of prompt deliveries at 12.85 cents. Following many conflicting reports, the latest information is that there will be no reduction in the

excise tax on copper imports of from 4 cents to 2 cents a pound, as the Chilean Government had requested in trade agreement negotiations.

A sharp drop in tin prices at Singapore caused the market's undertone here to be easier for the time being. With sterling exchange fluctuating more widely from day to day and British economic policies none too settled, the tin market is being closely watched.—W. C. H.

### Ethyl Sets Up Refinery Technology Division

A refinery technology division to aid refiners in meeting the problems arising from advances in petroleum chemistry and automotive engineering has been

established by the Ethyl Gasoline Corp. The new division will be located in Detroit, and, working in close association with the research staff of the Ethyl Corp., will begin operations in January, 1940. It will be headed by William H. Hubner, who for the past 10 years has been connected with the Universal Oil products Co., Chicago. J. B. Taylor, Jr., of the Ethyl engineering laboratories at Detroit, has been chosen as his assistant.

### Crude Rubber Consumption Down 2.6% in November

Consumption of crude rubber by manufacturers in the United States during the month of November, 1939, is estimated to be 54,422 long tons. This compares with 55,764 long tons during October, 1939, and represents a decrease of 2.6 per cent under October but is 10.7 per cent over November a year ago, according to statistics released by The Rubber Manufacturers Association, Inc. Consumption for November, 1938, was 49,050 (revised) long tons.

### N.A.D.A. Plans Program For Annual Convention

The National Automobile Dealers Association Convention Committee has completed a tentative program for the annual meeting which will be held in Washington, Jan. 22-25, 1940. The program will center around the subject of legislation with the view of framing the type of bill to be introduced in the next session of Congress for correcting unfair practices in the automobile industry, in accordance with the recommendations contained in the recent report of the Federal Trade Commission.

Heading the speakers' program will be Congressman Wright Patman, co-author of the Robinson-Patman Act, who will discuss "What's Ahead in Federal Legislation." On the same program will be a member of the FTC, and Harlan W. Kelley, special counsel of the Wisconsin State Banking Commission.

Other speakers on the convention program are Samuel Heimlich, veteran Dodge dealer of Long Branch, N. J.,

### New Car Registrations and Dollar Volume by Retail Price Classes\*

	OCTOBER, 1939		FIRST TEN MONTHS, 1939			
	Units	Dollar Volume	Units	Per Cent of Total	Dollar Volume	Per Cent of Total
Chevrolet, Ford and Plymouth...	97,312	\$74,400,000	1,184,368	54.46	\$870,300,000	47.06
Others under \$1,000.....	82,098	74,400,000	777,799	35.77	711,000,000	38.45
\$1,001 to \$1,500.....	30,702	34,700,000	180,850	8.32	209,800,000	11.35
\$1,501 to \$2,000.....	1,636	2,800,000	20,657	.95	32,000,000	1.73
\$2,001 to \$3,000.....	766	1,700,000	10,267	.47	23,300,000	1.26
\$3,001 and over.....	12	60,000	630	.03	2,860,000	.15
Total.....	212,526	\$188,060,000	2,174,571	100.00	\$1,849,260,000	100.00
Miscellaneous.....	45		676			
Total.....	212,571	\$188,060,000	2,175,247		\$1,849,260,000	

\* All calculations are based on delivered price at factory of five-passenger, four-door sedan, in conjunction with actual new car registrations of each model. The total dollar volumes are then consolidated by price classes.



whose subject is "Restoring Legitimate Competition in Automobile Selling"; and Charles W. Bishop, general counsel of the N.A.D.A., who will discuss the model contract which N.A.D.A. has prepared and submitted to the industry as a form of agreement to stabilize automobile retailing.

The convention committee consists of Harry Sommers, Atlanta, Ga., chairman; Lee D. Butler, Washington, D. C., co-chairman; C. M. Bishop, Brooklyn, N. Y.; and Herman Wangelin, Belleville, Ill.

## 40 YEARS AGO

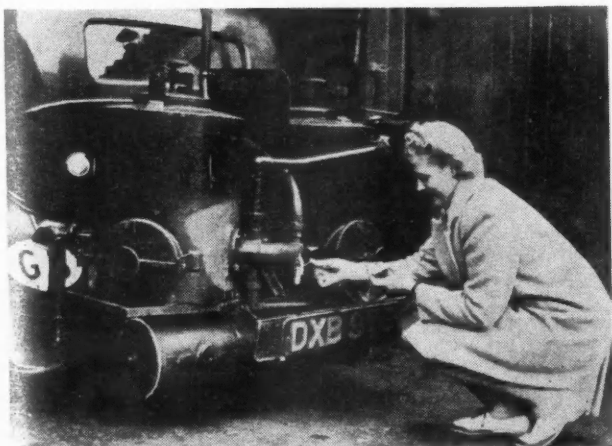
The new century opens most auspiciously for the motor vehicle industry in the United States. After five years of neglect the industrial infant is beginning to receive the attention its merit deserves. The manufacture of motor vehicles and accessories is now generally recognized as the coming industry for the next two decades, and the enterprising of all classes are turning to it as a new El Dorado where fortunes and commercial honors in plenty may be won.

..... It will not do to blindly imitate methods which in other lines and in other years achieved success. In all great industries as in all great men there is individuality. Let this individuality be found and developed, and a wise conservatism displayed in approaching the untried problems that confront us, and the New Year should be a happy year for the new industry.

From *The Horseless Age*, January, 1900.

## Battery Sales Up to \$110,000,000 in 1939

New research developments, coupled with improved business conditions, are expected to result in a 1939 automobile storage battery sales increase of approximately 15 per cent to give the industry a \$110,000,000 year, according to J. J. Newman, vice-president of the B. F. Goodrich Co.



International

## AUTOMOTIVE INDUSTRIES

### Summary of Automotive Production Activity

**BUSES** At the moment the sales picture does not appear to be especially bright. One manufacturer, currently operating at approximately 60 per cent production capacity, ventures the opinion that 1940 will be at least as good as 1939.

**TRUCKS** Production and sales generally running ahead of 1938 at the close of the year. A good deal of interest is being shown in medium-weight vehicles by European munitions missions.

**TRACTORS** One leader in the field reports "strong buying." Another states that profits for 1939 nearly double those for 1938. Good sales are anticipated as long as farm commodities bring good prices. New models have been well received and with much old machinery needing replacement, 1940 looks exceedingly good.

**AUTOMOBILES** December car and truck production estimated at approximately 450,000 units, a gain of 43,000 over December, 1938 and the largest monthly output since July, 1937. Preliminary estimate of total car and truck production for the 1939 calendar year places the industry's output at approximately 3,718,000 units, a gain of 40 per cent over 1938.

**MARINE ENGINES** Heavy Diesels still leading in production. War orders have some influence on current business but general better business conditions are held responsible in most quarters.

**AIRCRAFT ENGINES** In spite of increased backlogs of orders, commercial and military experts are pressing manufacturers' development departments for higher output. Accessory companies are working under full schedules, some reporting three eight-hour shifts.

*This summary is based on confidential information of current actual production rates from leading producers in each field covered. Staff members in Detroit, Chicago, New York and Philadelphia collect the basic information, in all cases from official factory sources.*

(Copyright 1939, Chilton Co., Inc.)

## Huge ASI Show Draws 25,000

### Numerous Meetings and Conferences Highlighted by Merger Action of Three "Aftermarket" Associations

The "automotive aftermarket," a generic term that has come into general usage to cover the vast market involved in servicing and maintaining America's 30,000,000 motor vehicles, displayed its tremendous size and importance in Chicago during the period extending from Dec. 7 through Dec. 16.

The chief attraction was the annual Automotive Service Industries Show held on Navy Pier during the week of Dec. 11 to 16; but closely rivalling it in importance were the annual conventions of the three national associations which join in sponsoring the show: National Standard Parts Association,

Motor and Equipment Wholesalers Association, and Motor and Equipment Manufacturers Association. Scores of other related meetings, sales conferences and affiliated events brought estimated attendance of individuals closely connected with automotive manufacturing and wholesale distribution to more than 25,000.

Coming to the 1939 Automotive Service Industries Show after a year which had shown highly encouraging sales gains over 1938, manufacturers offered attending wholesalers a gigantic preview of sales prospects for 1940, indicating by their lavish displays of new products, detailed merchandising programs and optimistic appraisals of the market that the coming year would witness further important business gains. Long recognized as the largest booth show in the world the most recent event added to its record size with more than 350 manufacturers occupying in excess of 110,000 sq. ft. of display space—an array of exhibits which would extend for more than three and one-half miles if placed end to end.

Confirming the optimism of exhibiting manufacturers were the sentiments expressed by wholesalers in attendance, with registrations running better than 10 per cent ahead of the previous year. This gain was shown in the number of

(Turn to page 43, please)

### Got a Match?

To get around the shortage of gasoline, some London motorists, like the one pictured here, have had coal-burning, gas-producing units built on the rear of their automobiles. When the vertical containers are loaded with coal, the driver lights the fire and, after a short wait, can move off sans gasoline.



## Business in Brief

*Written by the Guaranty Trust Co., New York, Exclusively for AUTOMOTIVE INDUSTRIES*

Moderate advances in general business activity are reported. The New York Times seasonally adjusted index for the week ended Dec. 9 extended its recovery to stand at 106.3 per cent of the estimated normal, as compared with 105.8 a fortnight earlier. The Journal of Commerce unadjusted index registered a corresponding advance of 4.7 points to 107.9 per cent of the 1927-29 average.

The seasonally adjusted index of industrial production compiled by the Board of Governors of the Federal Reserve System rose from 121 for October to 124 for November.

Seasonal expansion of retail trade was restricted in recent weeks by generally mild weather; sales volume ranged from 5 to 12 per cent above corresponding 1938 levels, according to Dun & Bradstreet estimates. Department store sales during the four-week period ended Dec. 9, according to the Board of Governors of the Federal Reserve System, were one per cent greater than a year ago, as against a similar gain of seven per cent for comparable periods a fortnight earlier.

Production of electricity by the power and light industry during the week ended Dec. 9 reached a new all-time peak, 11.5 per cent greater than the output a year ago.

The movement of railway freight declined less than seasonally in the same period. Loadings totaled 687,265 cars, 1623 fewer than for the preceding week but 11 per cent more than the corresponding figure last year.

Bank debits to individual accounts

in leading cities during the week ended Dec. 13 were two per cent above the total for the week before and nine per cent greater than a year ago.

Average daily production of crude oil during the week ended Dec. 9, reflecting a large increase in the output from Texas fields, was 3,827,350 barrels, 537,150 barrels more than in the preceding week and 207,650 barrels above the current required amount as computed by the Bureau of Mines.

Production of bituminous coal during the same period averaged 1,471,000 tons daily, as compared with 1,508,000 tons for the week before and 1,365,000 tons a year ago.

Construction contracts awarded in 37 States during November, according to F. W. Dodge Corp., amounted to \$299,847,000, or 15 per cent more than the October total and almost identical with that a year ago.

Mill consumption of lint cotton last month, 718,721 bales, the largest November total on record, has been exceeded only twice—in March and April, 1937.

Professor Fisher's index of wholesale commodity prices for the week ended Dec. 16, again establishing a 1939 peak, stands at 85.2 per cent of the 1926 average, as against 84.7 a fortnight ago.

Excess reserves of the member banks of the Federal Reserve system declined \$300,000,000 in the week ended Dec. 13 to an estimated total of \$4,850,000,000. Business loans of the reporting members rose \$38,000,000, marking a net increase of \$529,000,000 in 19 weeks.

## Committee Investigating NLRB May Move to Detroit

Washington reports indicate that it is entirely likely that the special House committee investigating the National Labor Relations Board will move to Detroit soon after the first of the year to hear witnesses present details of the labor disputes that have arisen in the automotive industry since the passage of the National Labor Relations Act. Rep. Howard W. Smith, chairman of the committee, said no decision had been reached as to when the hearings would be held in Detroit, but indicated that investigators have lined up a number of witnesses who have already been subpoenaed.

## Schey Reports NACA Tests

A paper on fuel injection and spark ignition engine performance presented before Detroit Section SAE, by O. W. Schey, National Advisory Committee for Aeronautics, summarized the work of the committee over a period of many years on large single cylinder aircraft engines. The test work included studies of various forms of combustion chambers, emphasizing the improvement afforded by turbulent chamber forms. Studies covered two-valve, and four-valve engines, cylinder injection, car-

buretor induction, manifold injection.

In conclusion, the author indicated that best results were obtained with direct cylinder injection, spraying horizontally across the chamber into the air charge, with turbulent chamber design, with large valve overlap so as to effect the maximum scavenging conditions.

Discussion of the paper brought out the point that aircraft carburetor performance had improved materially over

a period of years, narrowing the difference between carburetors and fuel injection, with gasoline and safety fuels. Emphasis was placed on the fact that the extremely high cost of injection equipment was a real bar to full commercial development.

## Ford Making 150 Tractors Daily

Assembly of the new Ford tractors at the Ford Motor Co. Rouge plant, Dearborn, Mich., is now at the rate of 150 daily. Four thousand men are employed on the tractor job.

## PUBLICATIONS

Palmer Bros. Engines, Inc., Cos Cob, Conn., has brought out a new catalog covering its complete line of marine engines.\*

Maas & Waldstein Co., Newark, N. J., has issued a technical data bulletin on M & W Codur enamels.\*

"Hydraulic Drives" is the title of a treatise discussing the performance, construction and application of hydraulic couplings and torque converters when applied to internal combustion engines which has been prepared by the Twin Disc Clutch Co., Racine, Wis.

"Your Car and the A.A.A. Contest Board", a reprint of an address by Col. E. V. Rickenbacker, chairman of the Contest Board of the American Automobile Association, has been published.\*

The Fidelity & Deposit Co. of Maryland has published a new edition of the booklet, "Matters of Procedure Under Government Contracts", by O. R. McGuire.\*

A leaflet prepared by the Johansson Div. of the Ford Motor Co. announces new chrome plated Johansson gage blocks.\*

Despatch Oven Co., Minneapolis, Minn., has issued bulletin No. 72 which describes its new direct gas-fired air heater.\*

An illustrated bulletin, published by the Russell Electric Co., Chicago, describes the company's Hold-Heat Pyrometer with



Acme

## Technical Secret

Here is the first plastic plane which is now undergoing tests at the plant of the manufacturer, the Timm Aircraft Corp. in Van Nuys, Calif. Technical details of the molding process are very carefully guarded secrets. The military type trainer is designated as the PT-160-K.

a new black crackle finish which is said to be impervious to oil and to avoid the tarnishing characteristics of bright metal.\*

A new one-piece, all-metal, self-locking nut that is claimed to overcome vibration problems is described in a folder prepared by the manufacturer, the Boots Aircraft Nut Corp., Waterbury, Conn.\*

An illustrated folder on its Air-Cell cushioning material, made of latex, has been published by the B. F. Goodrich Co., Akron, Ohio.\*

\* Obtainable from editorial department, AUTOMOTIVE INDUSTRIES. Address Chestnut and 56th Sts., Philadelphia.

## Canada Produced 18,412 Automobiles in November

Production of automobiles in Canada during November totaled 18,412 units compared with 9640 in October and 17,992 in November, 1938. Cumulative output for the 11 months ended November was 138,338 units compared with 147,472 in the same period last year. Of these totals, 7246 passenger cars and 2566 trucks were made for use in Canada, while 2636 passenger cars and 5969 trucks were intended for exports. Production since the beginning of 1938 and comparative figures follow:

	1939. Units.	1938. Units.
November .....	18,412	17,992
October .....	9,640	5,774
September .....	3,921	6,089
August .....	3,475	6,452
July .....	9,135	9,007
June .....	14,515	14,732
May .....	15,706	18,115
April .....	16,891	18,319
March .....	17,549	16,802
February .....	14,300	16,065
January .....	14,794	17,624
	1938.	1937.
January .....	17,624	19,583
February .....	16,066	19,707
March .....	16,882	24,901
April .....	18,819	17,081
May .....	18,115	23,458
June .....	14,732	23,941
July .....	9,007	17,941
August .....	6,452	10,742
September .....	6,089	4,417
October .....	5,774	8,113
November .....	17,992	16,574
December .....	19,670	21,115
Total .....	168,142	207,465

## Micromatic Hone Expands Facilities

Micromatic Hone Corp., Detroit, has leased additional space which will practically double the office and manufacturing space previously occupied. Further additions of machinery have substantially increased the company's productive capacity.

## Chrysler Fluid Drive Now Available on All Eights

The Chrysler fluid drive is now available on all of the company's eight-cylinder models. On the Traveler, New Yorker and Saratoga lines, it is listed as extra equipment at a cost of \$38. On the Crown Imperial, it continues as standard equipment.



International

## Signed for 1940

Edsel Ford, president of Ford Motor Co., as he signed the contract assuring the Ford exhibit's participation in the New York World's Fair in 1940. The announcement was made following a luncheon at which Henry Ford (left) and Edsel Ford were hosts to Harvey Gibson (center), chairman of the board of the Fair. Edsel Ford said that he and his father were delighted with the results their company obtained at the fair this year and that they believed the opportunity in 1940 would be still greater.

## Ourselves & Government

### A Check List of Federal Action Corrected to Dec. 21

#### Federal Trade Commission

**SIX PER CENT CASE**—Orders to cease and desist from use of the words "six per cent" or the symbol "6%" in connection with the installment payment plan of purchasing automobiles have been issued by the Federal Trade Commission against General Motors Corp. and its subsidiaries, including General Motors Acceptance Corp. and against Ford Motor Co.

**F.O.B. PRICE CASE**—Trial examiners' hearing held in Ford case in Detroit on Nov. 2. Next step will be trial examiners' report. Testimony closed in GM case, with trial examiners' report having been served on respondent company. After final arguments, the FTC order is next in line. Both cases involve the FTC allegation that the companies engaged in misleading price advertising.

**VS. GENERAL MOTORS**—Trial examiners' report due. Rebuttal testimony concluded Sept. 11. The FTC charge is that GM dealers are required to handle GM parts exclusively.

**FAIR TRADE PRACTICE RULES**—No indication when rules, now long overdue, will be promulgated.

#### National Labor Relations Board

**NLRB**—For the first time—has ordered the Ford Motor Co. to bargain with a trade union. In a unanimous decision announced on Dec. 8, the board directed the company to recognize the United Automobile Workers of America, CIO affiliate, and to reinstate about 275 strikers who walked out of

the Ford plant at Long Beach, Cal., in April, 1938. In addition, the company was told to compensate them for any losses sustained within five days after their application for reinstatement in the event they are not reinstated or placed on the preferential list.

#### Department of Labor

**STEEL WAGE CASE**—Government counsel have petitioned the Supreme Court, seeking review on a writ of certiorari of a decision handed down on Oct. 3 by the District of Columbia Court of Appeals, which held that the Labor Department's steel wage order calling for a minimum wage of 62½ cents in the East was "unwarranted," and represented a step beyond the authority conferred under the Walsh-Healy Public Contracts Act. A restraining order under which all steel companies can bid for government work without complying with the Labor Department order has been in effect since March, 1939. Lukens Steel Co., Coatesville, Pa., and six other small independent steel mills in the East brought the action against the Secretary of Labor.

## Tariff Commission Reports On Crude Rubber Situation

While admittedly an inadequate remedy, the Tariff Commission, pointing to a decline in United States crude rubber stocks from approximately 259,000 long tons on Oct. 31, 1938, to 133,000 tons on Oct. 31, 1939, has issued a report saying if a shortage of rubber occurs this country will undoubtedly use much greater quantities of reclaimed rubber. It added that the production of substitutes could be expanded but that probably from one to four years would be required before the industries would be in a position to produce even the minimum requirements of the United States.



## ADVERTISING

Studebaker will open the new year with an intensive, new distributor and dealer promotional campaign in automotive trade papers. Theme of the campaign will be that of the factory and field executives' personal familiarity with actual retail selling. The advertising, which begins in January, will carry photographs and biographies of the sales staff, the personal histories telling what the retail experiences of each executive has been.

Ross Roy Service, Inc., Detroit, will handle the Dodge truck account heretofore managed by Ruthrauff & Ryan. For the past 12 years Mr. Roy, head of the agency, has handled Dodge truck sales manuals and developed other sales helps for the company.

Advertising circles are hearing about a new tractor to be merchandised by Montgomery, Ward & Co., long an important factor in farm implement selling. A deal is said to have been closed with B. F. Avery & Co., Louisville, to round out the mail order house's line of farm equipment.

F. M. Stewart, for several years advertising and sales promotion manager of the U. S. Tire Dealers' Corp., New York, has been named head of the company's automobile tire department. He is succeeded by Charles J. Durbin.

Fruehauf Trailer Co. has turned a neat advertising hand in supplying log books, required by the Interstate Commerce Commission, to truck operators at cost. The books carry a Fruehauf advertisement.

### Financing Gained 16.4 Per Cent in October

The dollar volume of retail automobile financing for October 1939 amounted to \$109,792,573, according to the Bureau of the Census, U. S. Department of Commerce. This is an increase of 16.4 per cent when compared with September 1939; an increase of 63.3 per cent as compared with October 1938; and an increase of 0.5 per cent as compared with October 1937.

The volume of wholesale automobile financing for October 1939 the Bureau estimates as amounting to \$130,331,832. This is an increase of 99.6 per cent when compared with September 1939; an increase of 104.1 per cent as compared with October 1938; and a decrease of 2.7 per cent as compared with October 1937.

### Month-Old Strike At Waukesha Ended

Ratification of a proposal worked out between company officials and a committee of union representatives, ended a month-old strike at the Waukesha Motors Co., Waukesha, Wis., Dec. 12,

returning to work approximately 500 shop workers and about 200 office employees. The ratification followed weeks of negotiations between company officials and the AFL International Machinists union. The vote was 471 to 26 in favor of the proposal.

The agreement provides that the union be recognized as the exclusive bargaining agency for all shop employees; that increases in wages be granted by way of survey of wage rates, which survey will be completed about mid-January; clarifies the manner in which time-studies shall be made and the manner in which rates shall be set; for method of adjusting rates that are out of line; an eight-hour day, 40-hour week, overtime pay for Saturday, Sunday and holiday work; seniority rights. The contract expires Oct. 1, 1940, with automatic renewal clause.

### Will Study Proposed Sale Of Fisk to U. S. Rubber

Assistant Attorney General Thurman W. Arnold has announced that the Department of Justice will investigate "all of the facts" relating to the proposed sale of the Fisk Rubber Corp. to the United States Rubber Co. Mr. Arnold made this statement after conferring with Whitfield Reid, former general secretary and general counsel of the Fisk corporation but at present city solicitor at West Springfield, Mass., and counsel for a group of Fisk minority stockholders.

Opposition to the transaction was said by Mr. Reid to be due primarily because of the fear that it would result in the ultimate transfer of the Fisk plant at Chicopee, Mass., to some other section of the country. He said that such a transfer would take out of New England control of one of the most profitable industries in that section and put it elsewhere so that in the event of a business depression Massachusetts would stand to lose in a retrenchment by the larger concern.

### New Allis-Chalmers Industrial Tractor

A new industrial tractor, the Model "IB," has been introduced by Allis-Chalmers Manufacturing Co. With

13.5 drawbar hp., and weighing 2140 lb., this unit is designed to speed up hauling operations and cut material handling costs. It has both a foot brake and individual hand brakes on the rear wheels to facilitate maneuvering in cramped quarters, and has three forward speeds with one reverse. For power the "IB" has an 18 hp. heavy duty, medium speed engine.

### Curtiss Inaugurates Personnel Training

Believed to be the first of its kind in the country, a training school for employment candidates of the Curtiss Aeroplane division of Curtiss-Wright Corp. at Buffalo is being set up and will soon go into operation. About 50 persons will receive instruction in the rudiments of airplane mechanics during a study period of from four to six weeks. Raymond Watkins, former shop foreman, has been selected to supervise the training course. Those completing the course satisfactorily will receive employment as third class mechanics. The school is being organized because of war boom orders which have created a shortage of skilled airplane construction workers.

### Frank Ludlam

Frank Ludlam, assistant secretary and assistant treasurer of the International Nickel Co., Inc., died on Dec. 8 at his home in New York City, after a long illness.

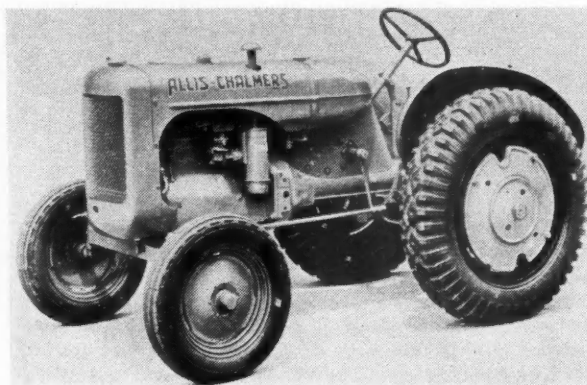
### Polk Reports Increased November Registrations

Returns on new passenger cars registrations in November, which cover 26 states of the nation, point to a good-sized increase over registrations in November of 1938, states R. L. Polk & Co.

The 26 states reported have an aggregate of 82,098 sales registered for November as compared to 67,050 in the same month last year—a gain of 22.44 per cent. Last month's returns are also 6.59 per cent above Oct., 1939, registrations which totaled 77,019.

Registrations from rural areas were relatively heavier in November than past experience indicated they would

Allis-Chalmers' new Model "IB" industrial tractor.





be, according to Polk. On returns to date total November, 1939, registrations are estimated at 235,000 units.

Truck registration reports from 26 states give November an 87.89 per cent gain over returns from the same area in November last year. The figures are 15,713 as compared to 8363, according to Polk figures. Last month's returns are 8.83 per cent over the 14,438 truck registrations in the same 26 states in October of this year.

## SAE Program

(Continued from page 31)

Corp.; "Ceramic Insulators for Spark Plugs", F. H. Riddle, Ceramic Div., Champion Spark Plug Co.; "Multi-Stop Delivery Vehicles", Ralph Werner, United Parcel Service; "Availability and Characteristics of Safety Fuels", Robert E. Ellis and W. J. Sweeney, Standard Oil Development Co.; "Alkylation as a Source of 'Safety Fuels'", Dr. Raymond Haskell, The Texas Co.; "Safety Fuels by Catalysis", W. M. Holaday, Socony-Vacuum Oil Co.; "Recent Opinions on Varnish in Engines", F. F. Kishline, Nash Motors Div., Nash-Kelvinator Corp.; "Lubricating Oils for Axles and Transmissions", W. S. James, Studebaker Corp.; "Seat Cushions and the Ride Problem", C. R. Paton, Packard Motor Car Co.; "Heating, Ventilating and Cooling of Passenger Cars", Herbert Chase, consultant and journalist; "The Performance of Modern Aircraft Diesels", Paul H. Wilkinson, consulting engineer; "Performance Limits of Spark Ignition Engines and the Fuel Aspect", J. J. Broeze, N. V. de Bataafsche Petroleum Maatschappij; "Plastics and Their Uses in the Automotive Industry", Dr. Gordon M. Kline, National Bureau of Standards; "The Spot Welding of Automobile Grade Mild Steel", Dr. Wendell F. Hess and Robert A. Wyant, Rensselaer Polytechnic Institute; "The Design and Manufacture of Hobs and the Hobbing of Gears", Charles R. Staub, Michigan Tool Co.; "Gasoline Cars and Surveys", J. B. Macauley, Jr., Chrysler Corp.; "Results of the 1939 Motor Survey", Donald Brooks, National Bureau of Standards; "The Load Carrying Capacity of Journal Bearings", S. A. McKee, National Bureau of Standards; "Directional Signals", Harry Doane, Buick Motor Div., General Motors Corp.; "The Automobile Headlamp Problem", P. J. Kent, Chrysler Corp.; "Supercharging High Speed Four-Cycle Diesel Engines", Robert Ramsey, Superior Engine Div., National Supply Co.; "Effect of Fuel Viscosity on Fuel Injection Equipment", G. W. Baerlein, American Bosch Corp.; "The Control of Smoke in the Automotive Diesel", W. W. Manville, G. H. Cloud, A. J. Blackwood and W. J. Sweeney, Standard Oil Development Co.

## Fritz J. Frank

Fritz John Frank, president of The Iron Age Publishing Co., died on Dec. 8 at the Northern Westchester Hospital, Mt. Kisco, N. Y., after a short illness. He was 68 years of age.

Mr. Frank devoted a lifetime of hard work and high accomplishment to the publishing business, the last 30 years of which were with *The Iron Age*, of which he was president and director at the time of his death. Active also in association work for the upbuilding of the publishing industry and its service, he was an outstanding figure in The Associated Business Papers and the president of that organization in 1923-24.

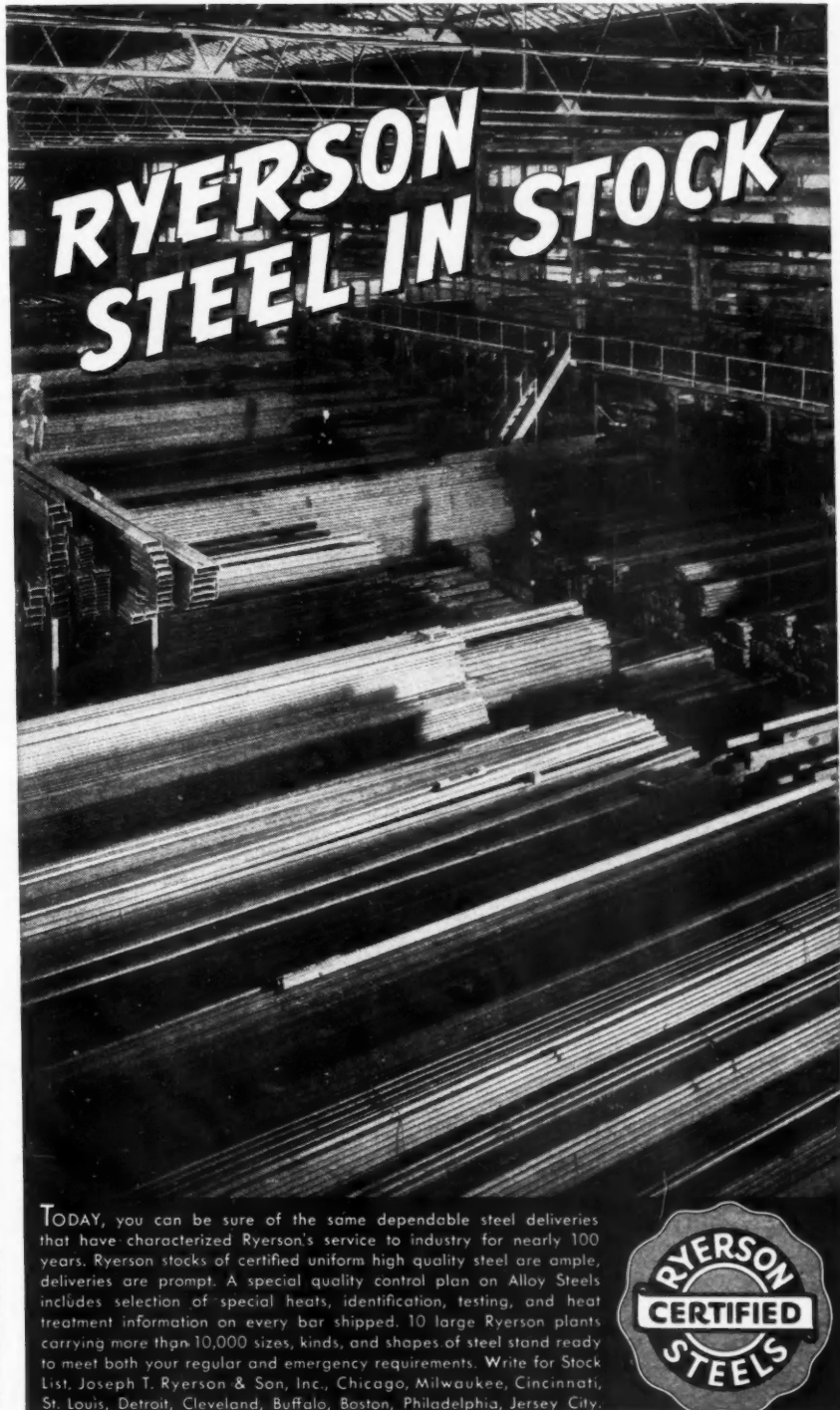
Fritz Frank was born in Emporium,

Pa., his parents being Joseph Warren Frank and Eliza Campbell Frank. He was graduated from Rollins College, Winter Park, Fla., with the degree of Bachelor of Arts in 1896 and was a member of Kappa Alpha fraternity. Shortly after this he commenced his publishing career by joining the *Colliery Engineer* later *Mines and Minerals* as advertising manager. Later, in 1902 and 1903 while with this publication, he made a tour of the world, investigating possible markets for American machinery. In 1906 he joined the *Mining and Scientific Press* as Chicago representative, continuing with that publication until 1910, when he came

with *The Iron Age* as advertising manager in the New York territory.

In 1911, Mr. Frank was made secretary of the David Williams Publishing Co., the predecessor of The Iron Age Publishing Co., and in 1918 was elected vice-president. In 1919, one year later, he became president and occupied this position to the time of his death.

In addition to his executive positions with *The Iron Age*, Mr. Frank was also executive vice-president of the Chilton Co., and held directorships in the Robins Publishing Co., the Business Publishers International Corp., the Newton Falls Paper Co., and the Savage Arms Co.



**RYERSON STEEL IN STOCK**

TODAY, you can be sure of the same dependable steel deliveries that have characterized Ryerson's service to industry for nearly 100 years. Ryerson stocks of certified uniform high quality steel are ample, deliveries are prompt. A special quality control plan on Alloy Steels includes selection of special heats, identification, testing, and heat treatment information on every bar shipped. 10 large Ryerson plants carrying more than 10,000 sizes, kinds, and shapes of steel stand ready to meet both your regular and emergency requirements. Write for Stock List, Joseph T. Ryerson & Son, Inc., Chicago, Milwaukee, Cincinnati, St. Louis, Detroit, Cleveland, Buffalo, Boston, Philadelphia, Jersey City.

**RYERSON CERTIFIED STEELS**

## BOOKS . . . .

### German Automotive Research

ELEVEN ADDITIONAL REPORTS OF DEUTSCHE KRAFTFAHRFORSCHUNG IM AUFTRAG DES REICHsverkehrsministeriums (*German Automotive Research to the Order of the Ministry of Transportation*).

The titles of the various reports

(published by VDI Verlag GmbH., Berlin NW 7) are as follows:

Heft 21—Korrosion durch Kraftstoffe (Corrosion by Motor Fuels), by Prof. Dr.-Ing. Georg Beck and Rudolf Künzelmann.

Heft 22—Reifenverschleiss bei Zwei- und Dreiachs - Lastwagenanhängern (Tire Wear on Two-Axle and Three-Axle Trailers), by Dr.-Ing. Otto Dietz and Dipl.-Ing. Ludwig Huber.

Heft 23—Spülvorgang bei Zweitaktmaschinen (The Scavenging Process in Two-Stroke Engines), by Dr.-Ing. habil. Otto Lutz and Dipl.-Ing. Wolfgang Noeggerath.

Heft 24—Gemishbildung im Saurer-Dieselmotor (Mixture Formation in the Saurer Diesel Engine), by Dr.-Ing. Karl Zinner.

Heft 25—Reibungskräfte, Laufunruhe und Geräuschbildung an Zahnradern (Frictional Forces, Roughness and Noise in Toothed Gears), by Dr.-Ing. Georg Dietrich.

Heft 26—Rollwiderstand von Luftreifen (Rolling Resistance of Pneumatic Tires), by Prof. Hans Kluge and Dipl.-Ing. Egon Haas.

Heft 27—Korrosionsangriff durch Kraftstoffe (Corrosive Attack by Motor Fuels), by Dr.-Ing. habil. Maximilian Marder and Dipl.-Ing. Heinz Farnow.

Heft 28—Gewinde in Leichtmetall—Toleranzen und Gewindefestsitz (Threads in Light Alloys—Tolerances and Fits), by Dr.-Ing. Erhard Lippert.

Heft 29—Zylinder und Kolbenverschleiss (Wear of Cylinders and Pistons), by Prof. Dr. Georg Beck.

Heft 30—Nickelfreie Baustähle (Nickel-free Construction Steels), by Prof. Dr.-Ing. Walter Eilender, Dr.-Ing. habil. Heinrich Cornelius, and Dr.-Ing. Heinrich Arend.

Heft 31—Messung der Klopfestigkeit an Otto-Motoren (Measurement of Anti-Detonation Characteristics of Otto-Cycle Engines), by Dr.-Ing. Rudolf Schütz.

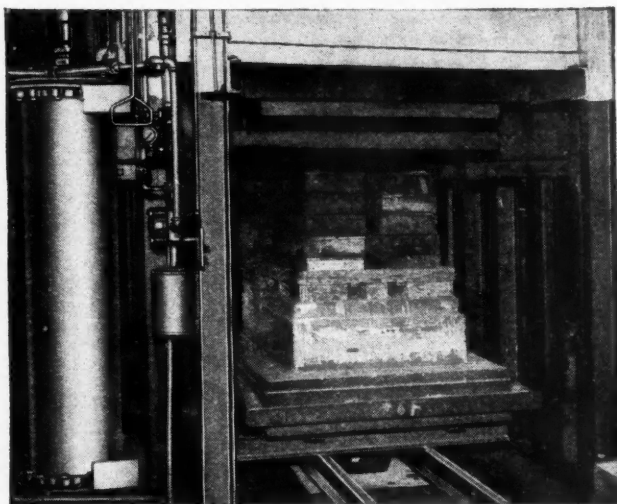
A.S.M.E. MECHANICAL CATALOGUE AND DIRECTORY, 1940. Published by the American Society of Mechanical Engineers, 29 West 39th Street, New York, N. Y.

This well-known directory of manufacturers of machines, equipment and materials employed in the mechanical engineering industries has just appeared in its thirty-ninth edition. It is divided into four sections. The catalogue section contains detailed descriptions of many items used by industry in manufacturing its products and in maintaining its plants. The Directory indicates the source, and in many instances the particulars, of machinery, equipment and supplies used by mechanical engineers. There is also an alphabetical list of trade names supplied the publishers by firms who pay for the service, while the final section is a catalogue of A.S.M.E. codes, standards, periodicals and other publications.

MEASUREMENT AND ANALYSIS OF NOISE AND VIBRATION, by Daniel Silverman. Published by The Instruments Publishing Company, Pittsburgh, Pa.

This treatise on the measurement and analysis of noise is published in the usual format of technical periodicals. The subject matter is divided into eighteen sections and two appendices. Among the section headings are the following (which will give a still more specific idea of the contents of the publication than its title): Acoustical Basis of Sound Meters; Total Sound Meters—Subjective Instruments; Total Sound Meters—Objective Instruments; Standards for Sound Meters; Vibration Measurement; Total Sound Meters

## SPEED UP OPERATIONS WITH CURTIS CYLINDERS



Jefferson Electric Company gets faster, smoother material handling at low cost with Curtis Air Cylinder.

Over six years ago Jefferson Electric Company, Bellwood, Illinois, installed this Curtis Air Cylinder to hoist metal charges into their annealing oven. The operation was speeded up, control made positive, and the accident hazard minimized... to the great satisfaction of the management and the men. The only maintenance cost has been the occasional replacement of a plunger gasket!

Curtis Air Cylinders are simple and rugged—only one moving part. They are not subject to injury from

over-loading or bad atmospheric conditions. The power cost is low, and maintenance negligible.

Your plant probably has a lift, push, or pull operation which can be done better at less cost with a Curtis Air Cylinder—the smoothest, lowest cost and most dependable power application available.

**FIND OUT** how Curtis Air Cylinders and Hoists can increase efficiency and profits in your plant. Send in the coupon for our 28-page booklet, "How Air is Being Used in Your Industry."

# CURTIS

Compressors • Air & Hydraulic Cylinders  
Air Hoists • I-Beam Cranes & Trolleys

CURTIS PNEUMATIC MACHINERY CO., 1917 Kienlen Ave., St. Louis, Mo.  
Gentlemen: Please send me the 28-page booklet,  
"How Air is Being Used in Your Industry."

Name \_\_\_\_\_

Street \_\_\_\_\_

Firm \_\_\_\_\_

State \_\_\_\_\_

City \_\_\_\_\_



—Recording Types; Sound - Analysis Instruments; Direct - Resonating Instruments; Heterodyne-Type of Analyzing Instrument; Filters for Heterodyne Instruments; Special Types of Analyzing Instruments; Miscellaneous Noise Instruments; Interference Patterns; Methods of Quieting Machines.

## MEN . . . . .

George F. Bauer has resigned from the staff of the Automobile Manufacturers Association to establish offices in New York City as an International Trade Counsellor. Mr. Bauer was secretary of the Association's Export Committee.

John R. (Jack) Emerson has been appointed chief engineer of the Marvel-Schebler Carburetor Division of Borg-Warner Corp., Flint.

New officers of the American Standards Association are, as follows: Edmund A. Prentis of the firm of Spencer, White & Prentis, New York, re-elected president; R. E. Zimmerman, vice-president, United States Steel Corp., re-elected vice-president; R. P. Anderson, secretary of the Division of Refining, American Petroleum Institute, elected chairman of the Standards Council to succeed F. M. Farmer; H. S. Osborne, engineer in charge of operating results of the American Telephone and Telegraph Co., elected vice-chairman of the Standards Council.

Recent appointments of Dodge Division, Chrysler Corp., include Charles E. Sering as manager of the Cincinnati region, succeeding C. W. Chapman, resigned, and L. F. Van Nortwick to succeed Mr. Sering as manager of the Detroit region.

Resignation of Carl H. Kindl as general manager of the Delco Products Division of General Motors Corp., has been announced. Frank H. Irelan, former production manager of Delco Products, and for the past several years general manager of the Delco Brake Division, succeeds Mr. Kindl as general manager of the Delco Products Division. B. A. Brown, factory manager of Delco Products, is general manager of Delco Brake, succeeding Mr. Irelan. Paul H. Rutherford, formerly chief engineer at Delco Products, is now factory manager. Edwin F. Rossman, assistant chief engineer, has succeeded Mr. Rutherford as chief engineer, and Calvin J. Werner has moved up to assistant chief engineer.

New appointments on the sales staff of the Mechanical Division of the B. F. Goodrich Co. are: I. N. Kimsey, manager; R. A. Charlton, assistant manager of the Akron Sales Division; J. S.

Gulledge, manager of the St. Louis district; and A. M. Fiala, product sales manager of the Air-Cell Division.

Kenneth P. Hayes has been named assistant service manager of the Timken-Detroit Axle Co., succeeding the late Fred A. Busse.

R. L. Forney, assistant to the managing director of the National Safety Council, has been appointed director of the Council's Industrial Division.

Pratt & Whitney Aircraft, Division of United Aircraft Corp., has announced the following appointments: William P. Gwinn, assistant sales man-

ager; A. H. Marshall, chief of sales engineering; Hubert A. Gosselin, West Coast representative; E. M. Lester, representative at Wright Field, Dayton, Ohio.

Gordon McColl has been appointed director of the tractor division, sales department, Ford Motor Co. of Canada, Ltd., Windsor, Ont.

R. M. Hoffman, vice-president and sales manager of Link-Belt Co. Pacific Division, San Francisco, for the past eight years, has been appointed assistant to the president of the parent (Turn to next page, please)



**Stressproof News**

**MORE NEWS**  
about **STRESSPROOF\* No. 2**  
La Salle's NEW Cold Finished Bar Steel

Parts made from STRESSPROOF No. 2 are ready for service following the last machining operation because as received by you, STRESSPROOF No. 2 has a minimum yield point of 100,000 lbs. per sq. in.; unique wearability and freedom from warpage.

STRESSPROOF No. 2 is not presented as the full equal to heat treated alloy steel or a case hardened steel, but laboratory test, production tests, and the experience of hundreds of users have proven that it will satisfactorily serve for numerous applications now produced from heat treated or case hardened steels.

STRESSPROOF No. 2 is priced lower than any other high strength Cold Finished steel bar, has 80% of machinability of Bessemer Screw Stock . . . and worthwhile savings must result wherever it is applicable.

Write . . . or return the coupon below . . . for descriptive booklet which will help you determine if you, too, can make savings through the use of this new steel.

**La Salle STEEL COMPANY**  
Manufacturers of The Most Complete Line of Cold Finished Steel Bars in America

\*T. M. Roy, U. S. Pat. Off.

LA SALLE STEEL COMPANY, P. O. Box 6800-A, Dept. 1E, Chicago, Illinois  
Please send STRESSPROOF Data Booklet

Name . . . . . Position . . . . .  
Company . . . . . Address . . . . .  
City . . . . . State . . . . .



## Men

(Continued from page 39)

organization, Link-Belt Co., with headquarters at the company's general offices in Chicago.

R. E. Dillon, president of the Lake Erie Engineering Corp., has been elected a director of the Marine Trust Co., Buffalo.

H. O. West has been made special assistant to the president of Boeing Aircraft Co. He was most recently active

in the formation of Trans-Canada Airlines.

H. G. Hersh, formerly assistant sales promotion manager, has been made sales promotion manager for Pontiac. Appointed in addition are P. R. Warmee and H. W. Bygel as assistant sales promotion managers in charge of new cars and used cars respectively.

W. H. Blackmer has been appointed sales engineer for the New England and Metropolitan New York areas of John S. Barnes Corp.

J. T. Staker has been appointed man-

ager of the fleet sales division of the truck and bus tire department of the B. F. Goodrich Co. H. G. Courier has been made western manager of the fleet sales division. Guy Gundaker, Jr., has been appointed special representative to the assistant general sales manager of the tire division.

Julian B. Hatton is forming a new company, Hatton Leather Co., to produce upholstery leathers, at Grand Haven, Mich. A new plant is in the process of erection and the company expects to be in production shortly after the first of the year.

Roy W. Carlings has been made head of the newly created business development department of U. S. Tire Dealers Corp.

M. D. Church has been elected vice-president of Worthington Pump and Machinery Corp. and R. W. Towne has been made assistant secretary.

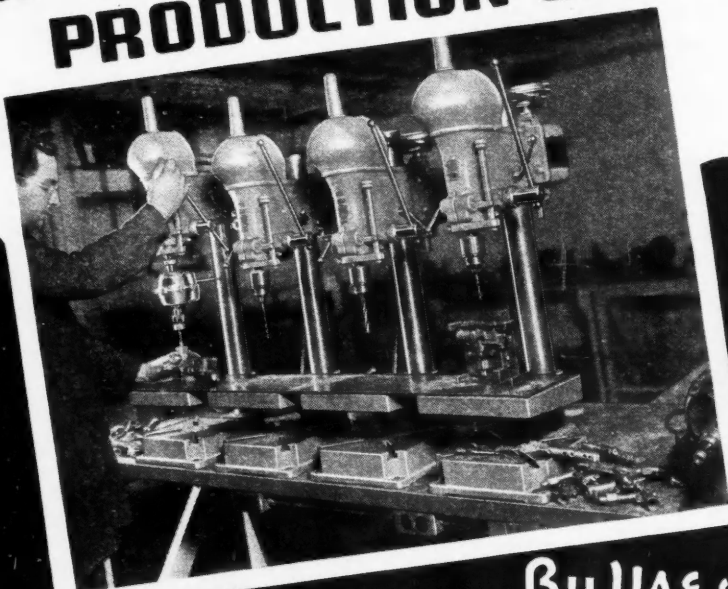
A. L. Struble has been appointed general sales manager of Fruehauf Trailer Co.

Udylite Corp. announces the appointment of A. B. Hoefer as eastern district manager. He replaces W. L. Cassell who resigned to join MacDermid, Inc.

G. J. Connelly has been made production manager and chief engineer of Covered Wagon Co. He was formerly division superintendent with Packard Motor Co.

J. Wheatley has been appointed chief research engineer of Glenn L. Martin Co. For the preceding two years Mr. Wheatley has been in charge of aerodynamics and flight test engineering at the El Segundo division of Douglas Aircraft Co.

## Lower PRODUCTION COSTS!



## By Use of DURO PRECISION BALL BEARING DRILL PRESSES

A Chicago Manufacturer reports a surprising reduction in his production costs on these drilling and tapping operations since installation of this battery of four Duro Precision Ball Bearing Drill Presses. The operator moves quickly from one spindle to the next for continuous production. Just one set up where two were formerly required. And what is equally important, this new equipment costs less than 1/2 as much as his older and less efficient equipment.

Let us show you how you too can reduce your costs by installing these modern precision tools. Whether you need one or a hundred Drill Presses for Standard set-ups or special requirements, their sealed ball bearing construction makes them easily adapted for drilling or tapping at any angle. Send for catalog describing the full line of tools.

Manufactured by the Makers of America's Finest and Most Complete Line of Power Driven Machinery.

**DURO METAL PRODUCTS CO.**  
DEPT. AM-1 — 2651 N. KILDARE AVE., CHICAGO, ILL.

## CALENDAR

### Conventions and Meetings

National Aeronautic Association of the United States, Annual Convention, New Orleans, La. ....	Jan. 10
U. S. Chamber of Commerce, General Conference on Light and Signal Equipment .....	Jan. 11-12
SAE Annual Meeting & Engineering Display, Book-Cadillac Hotel, Detroit .....	Jan. 15-19
National Automobile Dealers' Association, Annual Convention, Washington, D. C. ....	Jan. 22-25
American Road Builders' Association, Convention, Chicago. ....	Jan. 29-Feb. 2
Chamber of Commerce of the United States, Annual Convention, Washington, D. C. ....	April 30-May 2
American Society for Testing Materials, Annual Convention, Atlantic City, N. J. ....	June 24-28

### Shows at Home and Abroad

National Motor Boat Show, Grand Central Palace, New York. ....	Jan. 5-13
Leipzig Trade Fair, Germany, March 3-10, 1940	

## IN OTHER WORDS

Two additions to the "slang" of the industry have come our way. The following were sent in by R. H. Wolff, Le Roi Co., Milwaukee:

**Woodpecker**—an automatic oil hole drill press.

**Bucket**—Name applied to any of the smaller type cars.

## Tire Sales in 1939 Eclipse 1938 Mark

Tire sales in 1939 totaled about 56,000,000 units, compared with 43 million in 1938. This is the largest volume the industry has had in 10 years, according to A. L. Viles, president, the Rubber Manufacturers Association, Inc.

Sales to automobile manufacturers for original equipment, states Mr. Viles, rose from 11,500,000 in 1938 to about 17,200,000 in 1939 because of the increased production of new cars, while replacement sales jumped from 30,500,000 in 1938 to approximately 38,000,000 in 1939, the highest figure in eight years. Export sales remained at about a million units.

## Buick Introduces New Station Wagon

Introduction of a new "Estate Wagon" as an addition to the 1940 line of Buick models has been announced by Harlow H. Curtice, president of the Buick division of General Motors Corp. The new model is of the regular station wagon type, but designed and equipped to luxury standards.

The new "Estate Wagon" is in the Buick lower medium price group with an advertised delivered price at the factory of \$1,242. It has a Deluxe two-seater, six-passenger, four-door body, with luggage and carrying capacity of 52.8 cu. ft. The new model is built on the new Buick Series 50 Super chassis. The car is powered by the Series 50 engine.

## Martin Co. Producing New Combat Airplanes

Glenn L. Martin Co. began cutting material in mid-December for the first of the new type medium bombers which it is building for the United States Army Air Corps. The company was awarded a \$16,000,000 contract for this new ship as the result of a design competition held on July 5, 1939. The bomber, which will be known by the Army designation B-26, is a bi-engined, all-metal monoplane.

## Government Closes Arms Contract With Colt's

A closing agreement with the Treasury Department under which the

Colt's Patent Fire Arms Mfg. Co. will be permitted to charge off as an indirect factory expense the cost of special tools, jigs, dies, fixtures and gages which the company must acquire to carry out a government arms contract, but which are useful only for the particular order involved, has been announced by Secretary of the Treasury Morgenthau. It was the first closing agreement to be executed under the Vinson-Trammell and the National Defense Acts.

It was emphatically denied that the agreement involved any tax concession, but on the contrary was said to give the contractor nothing more than could

have been received ordinarily under the provision of the law. In other words, the only thing the manufacturer gains by such agreements is the advantage of knowing in advance what depreciation and obsolescence allowances will be permitted on plant and equipment for income-tax purposes and for purposes of calculating allowable profit under the Vinson-Trammell act as amended last year by the National Defense Act.

The Vinson-Trammell act limited profits on aircraft or vessels for the Navy to 10 per cent, while the new law fixed the allowable profit on aircraft at 12 per cent.

# STARTING THE 37<sup>th</sup> YEAR RIGHT!

● As Spicer inaugurates its 37th year of continuous manufacturing operations, our sincere thanks go to the growing number of Spicer friends who made 1939 one of our most successful years.

In 1940, Spicer pledges greater achievements in setting new high standards of equipment dependability and performance by utilizing its extended facilities of long

experience . . . broad research and engineering . . . manufacturing skill. Spicer products in 1940 will assure greater efficiency and economy of operation for users . . . will win and hold satisfied customers and repeat business for passenger car, truck, bus and tractor builders.

Spicer offers you these essential factors to help you achieve a greater degree of success in 1940.

# Spicer

**Spicer Manufacturing Corporation • Toledo, Ohio**

BROWN-LIPE  
CLUTCHES and  
TRANSMISSIONS

SALISBURY  
FRONT and REAR  
AXLES

SPICER  
UNIVERSAL  
JOINTS

PARISH  
FRAMES  
READING, PA.

## Passenger Car and Truck Production

Passenger car and truck production in the United States and Canada amounted to 370,194 during November, a decrease of 4.5 per cent from November, 1938, when 387,836 cars and trucks were produced. The November figure for this year does, however, represent an increase of 14.6 per cent over October of this year. Passenger car production amounted to 295,134, while trucks accounted for 75,060.

During the first 11 months of 1939 total production amounted to 3,263,372,

an increase of 45 per cent over the 2,248,211 produced during the same period of 1938. Of these, 2,590,284 were passenger cars and 673,088 were trucks.

## Lincoln Foundation \$200,000 Award Program

A two-and-a-half-year program of scientific study which will culminate in payment of \$200,000 in awards has been announced by the James F. Lincoln Arc Welding Foundation, Cleveland, Ohio. Four hundred and fifty-eight awards will be made for studies bringing out benefits of a social, eco-

nomic or commercial nature, such as reduction or elimination of hazards to safety and health, greater availability of comforts and conveniences through reduced prices, greater utility and durability of machines and structures as well as industrial benefits such as cost savings and other advantages in manufacture, fabrication or construction. These studies must, however, report progress which can be attributed to application of the electric arc process of welding within the two-and-a-half-year period, Jan. 1, 1940, to June 1, 1942.

## 2000-Hp. Engine Approved by CAA

After satisfactory completion of extensive laboratory and flight tests by its Aircraft Airworthiness Section, the Civil Aeronautics Authority has issued a type certificate to the Wright Aeronautical Corp. of Paterson, N. J., for the manufacture of a new, 18-cylinder air-cooled engine which develops 2000 hp. on take-off.

Built primarily for use in large transport aircraft, it is the most powerful engine ever certificated for commercial purposes in this country. The engines installed in the majority of the present-day airliners have take-off ratings of 1100 hp. The Boeing-built transoceanic Clippers are equipped with engines which develop 1500 hp. each on the take-off.

## November Rim Inspections Top 1938 by 4.6 Per Cent

The total number of rims inspected and approved by the Tire & Rim Association, Inc., during November amounted to 1,783,257, an increase of approximately 4.6 per cent over November a year ago. For the first 11 months of 1939 the number of rims inspected and approved by the association aggregated 15,401,115, an increase of approximately 75 per cent over the similar period in 1938.

## Molybdenum — Aluminum Are "Morally Embargoed"

The State Department has added molybdenum and aluminum, because of their use in the manufacture of aircraft, to the list of metals morally embargoed to countries for unprovoked bombing and machine-gunning of civilians from the air. The State Department told producers of molybdenum and aluminum in a letter dated Dec. 15 that these metals are included in "materials essential to airplane manufacture" mentioned by President Roosevelt on Dec. 2 in a statement applying a moral embargo similar to the embargo he applied against Japan two years ago. Broadening of the embargo means that, no matter for what use they may be intended, molybdenum and aluminum are added to the list of products which should not be exported to either Russia or Japan.



# Accuracy to Specifications is Demonstrated in Office Equipment Parts




Manufacturers of office machines demand cold rolled strip steels that are accurate to gauge and temper, and true to physical properties that give high resistance to wear after heat treatment—steels that are uniform "inch by inch" for the duplication of small but exceedingly important mechanical parts.

For many years, Thomastrip has met the exacting specifications of these important manufacturers. These manufacturers have kept their eyes for steel qualities and every facility at their command to determine what steels will perform with greatest economy in their efficient shop practice.

The Thomas organization can capably supply you, too, with cold rolled strip steel to meet exacting requirements.

**Steels That Stimulate Progress**

**THE THOMAS STEEL CO.**  
SPECIALIZED PRODUCERS OF COLD ROLLED STRIP STEEL  
WARREN, OHIO

Bright Finish Uncoated, and Electro Coated with Nickel, Zinc, Copper, Brass, Bronze, and Tin



## Cummins Awards Building Contract

Contracts for the design and construction of a 10,000-sq. ft. research and development laboratory for the Cummins Engine Co. at Columbus, Ind., have been awarded to The Austin Co., engineers and builders. Planned, the company says, to provide the finest testing and engineering facilities available in the diesel industry, this structure will be of welded rigid frame construction.

A machine shop, 50 ft. by 100 ft., entirely without obstructions, will be provided. Special metallurgical and chemical laboratories are also included in the structure, which will have a number of testing rooms for Diesel power units and parts.

## Contracts Awarded By Navy Department

The Navy Department's Bureau of Supplies and Accounts has awarded a \$7,927,272 contract for aircraft engines to the Pratt & Whitney Division and a \$1,293,647 contract for propeller assemblies to the Hamilton Standard Propellers Division, United Aircraft Corp., East Hartford, Conn.

A \$163,961 contract, also for propeller assemblies, was awarded Curtiss-Wright Corp., Clifton, N. J.

The Bureau also awarded a \$20,016,699 contract to the Consolidated Aircraft Corp., San Diego, Cal., for airplanes.

## Legislative Program Announced by CIO

Announcing its legislative program for the forthcoming session of Congress, John L. Lewis' CIO urges that criminal penalties be written into the Wagner Act for violators, that violators be barred from securing Government contracts, and that the act be amended to prevent the National Labor Relations Board from "carving up any industrial units established by the industrial union of the CIO."

On taxation the CIO calls for reduction of the present "tax burden on consumer groups and wage earners, and "tapping large concentrations of income and savings." The proposal includes an excess profits tax, elimination of exemptions on Government securities, higher gift and inheritance levies and higher rates and closing of loopholes in taxes on upper bracket income.

Other features of the program call for keeping America out of the European war, a solution to the unemployment problem and protection of civil liberties.

Describing unemployment as still the Nation's No. 1 problem, the program calls for a "conference of responsible

leaders from the Government, industry, agriculture and labor" as a first step to solution, and pending such a conference, for 3,000,000 jobs for the unemployed on public projects. A "substantial increase" in appropriations "to employ all young people who are out of work and out of school" is urged.

The program was drawn up by the Legislative Committee of the CIO, meeting in Washington. The committee is composed of John L. Lewis, chairman, Philip Murray, Sidney Hillman, Sherman R. Dalrymple, Emil Rieve, Reid Robinson, R. J. Thomas, James B. Carey and Lee Pressman, secretary.

## ASI Show

(Continued from page 33)

wholesale firms attending with statistics unavailable immediately on the increase in numbers of representatives from each firm. Wholesalers came to the show not only to appraise new products but also to confer with factory executives about sales policies and to schedule their own sales organizations for cooperation with new factory marketing programs.

Almost eclipsing the show in importance (Turn to next page, please)



## ONLY LAPPING As Strom Does It CAN PRODUCE SUCH PRECISION

Strom Steel Balls possess a degree of surface smoothness and sphericity that has never been equalled in any other regular grade of ball. Such precision is exclusive with Strom because it can be attained only through a series of lapping operations such as are standard practice in the Strom plant.

Physical soundness, correct hardness, size accuracy and sphericity are guaranteed in all Strom Balls.

Other types of balls—*stainless steel, monel, brass and bronze*, are also available in all standard sizes.

Write for complete details.

# Strom

## STEEL BALL CO.

1850 So. 54th Avenue, Cicero, Ill.

*The largest independent and exclusive Metal Ball Manufacturer*

## ASI Show

(Continued from page 43)

tance was the action taken by the three sponsoring associations to correlate all of their activities more closely—an action which, in its final practical application, will result in a merger reducing the present number of aftermarket associations from three to two. While not fully consummated at the meetings in Chicago wholesalers and manufacturers affiliated with the various associations voted approval of a movement which will result in a single large na-

tional association of aftermarket manufacturers and another similar association of automotive wholesalers. The two associations will be entirely autonomous but it is expected that they will be loosely joined together on matters of general aftermarket interest through a joint committee or committees similar to that which has operated the Automotive Service Industries Show for the past 10 years.

In effect the movement calls for dissolution of the present wholesalers division of the NSPA, and a similar dissolution of the present MEWA, to form a new wholesalers association which probably will be known as the Auto-

motive Wholesalers Association when all details of the coalition have been completed. Present wholesaler directors of NSPA will join with the directors of MEWA in perfecting details of the merger. Exactly the same procedure is called for in bringing together the manufacturers division of NSPA and the MEMA except that because of expediency it was decided to effect the combination under the present corporate structure of the MEMA instead of going through the details of organizing a new manufacturers association. It was announced at the annual meeting of the MEMA on Dec. 12 that the principal steps already had been taken and that effective Jan. 1, NSPA manufacturers were joining MEMA manufacturers on a basis of complete equality. Directors of the NSPA manufacturers division will be added to the directors of the MEMA to give the association a 22-man board for the coming year.

Each of the three associations elected officers and directors in accordance with their annual custom and it is expected that all officers will serve their respective groups until the contemplated mergers have been fully consummated, with no new officials to be named until the annual meetings to be held at the time of the next ASI Show. Meanwhile the new presidents of the respective associations renewed their annual agreement to sponsor the next show, time and place for which will be determined after memberships of the associations have been balloted by mail. Officers and new directors named were:

National Standard Parts Association: President, V. C. Anderson, Motor & Axle Parts Service, Inc., Chicago; Senior Vice-President, Burke Patterson, Thompson Products, Inc., Cleveland; Junior Vice-President and Chairman of Wholesalers' Board of Governors, R. L. Terry, United Wholesalers, Sioux City; Chairman of Manufacturers Board of Governors, A. G. Drefs, McQuay-Norris Mfg. Co., St. Louis. Manufacturer directors: Victor Allen, Automotive Maintenance Machinery Co., North Chicago; Andrew Brown, Andrew Brown Co., Los Angeles; W. B. Bradenbaugh, Keystone Reamer & Tool Co., Millersburg, Pa.; E. J. Tesdell, Gates Rubber Co., Denver; S. M. Prior, Fafnir Bearing Co., New Britain, Conn. Wholesaler directors: R. L. Terry, George Scheufler, Scheufler Supply Co., Inc., Great Bend, Kan.; George Korshin, South Shore Motive Parts Co., Lynbrook, N. Y.; B. F. G. Keam, Monarch Auto Supply Co., Covington, Ky.

Motor and Equipment Manufacturers Association: President, D. S. Brisbin, re-elected, Columbus-McKinnon Chain Corp., Tonawanda, N. Y.; Vice-President, F. W. Swanson, Globe Hoist Co., Des Moines, Ia.; Secretary, R. L. Somerville, The Electric Storage Battery Co., Philadelphia, Pa.; Treasurer, C. P. Brewster, re-elected, K-D Mfg. Co., Lancaster, Pa. New MEMA directors

(Turn to page 46, please)



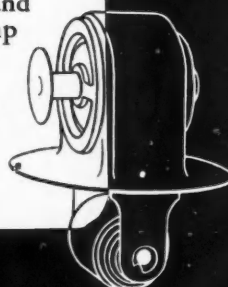
# Automotive Engineers TAKE NO CHANCES ON MOTOR TEMPERATURE CONTROL

● Left without attention for long periods ... called upon to handle a precision job automatically under a wide variety of road, load and weather conditions ... automotive thermostats must perform accurately every time and thousands of times.

The use of Dole Thermostats by many leading automotive engineers...and the preference of these same engineers for Dole Bi-Metal in devices of their own development ...offer convincing proof of the dependability of Dole engineered products and precision procedures.

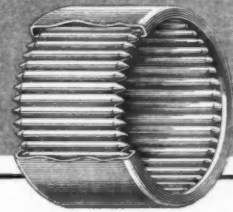
Dole Thermostatic Bi-Metal is sold separately in sheets, coils or partly fabricated material. It is the actuating force in Dole Double Poppet Type Thermostat ... famed throughout the industry for positive elimination of sticking, binding and friction ... and for precise control of circulation and temperature of water regardless of pump pressure. Write for engineering information or buying data.

**THE DOLE VALVE COMPANY**  
1901-1941 Carroll Ave., Chicago, Ill.  
Detroit Office: General Motors Building

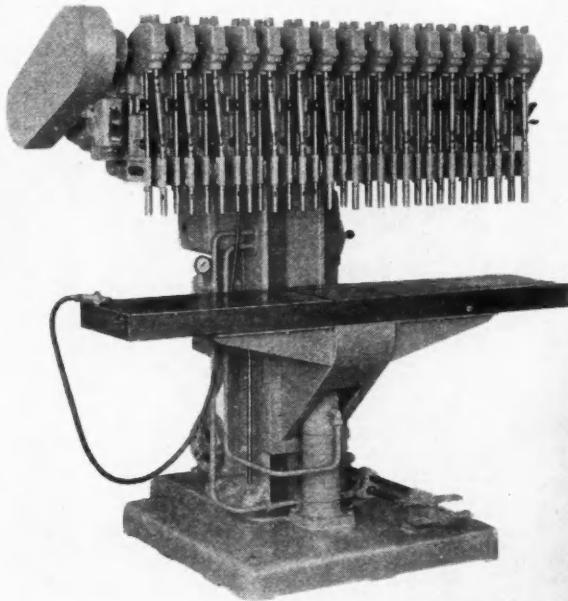


# DOLE THERMOSTATS and BI-METAL

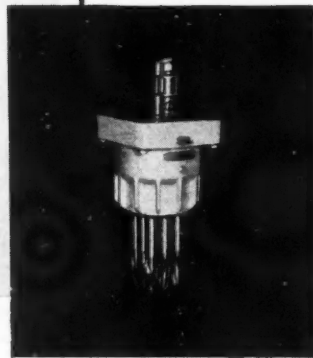
# No Bearing Replacement IN 4 YEARS



**TORRINGTON  
NEEDLE BEARINGS  
TAKE SPINDLE SHOCK  
LOADS THAT ONCE  
RUINED BUSHINGS**



(Above) Intricate Multiple Spindle Drill in which 105 Torrington Needle Bearings give trouble-free performance under very close space limitations.



(Above) B. M. Root Company's 9-Spindle Fixed Center Drill in which 19 Torrington Needle Bearings are used.

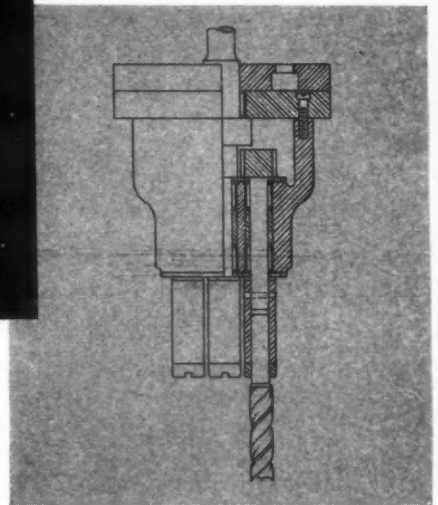
**H**UNDREDS of multiple-spindle Fixed Center Drills equipped with Torrington Needle Bearings have been in service since 1935 with never a call for bearing replacements. B. M. Root Company of York, Pa., manufacturer of the equipment, states that *Torrington Needle Bearings have virtually eliminated servicing.*

One hundred and five bearings are used in the large unit shown above, and the B. M. Root Company says, "One of the greatest advantages is the fact that in many close-center applications it is the *only* anti-friction bearing that could possibly be used."

The full complement of rollers in these bearings provides many linear inches of contact with resulting high capacities. Small, light, simple in design, simple to install, they frequently allow economies in machine assembly in addition to increasing efficiency.

After Needle Bearings were installed in the 9-Spindle drill shown, higher speeds

(Right) Cross-section shows how Needle Bearings overcome space limitations and keep spindles in alignment.



were obtained without additional provision for lubrication. Because of the lip construction of their retaining shells, these bearings not only retain lubricant for long periods but also keep out dirt and metal chips ruinous to bushings.

The Torrington Engineering Department will be glad to work with *you* in adapting the advantages of the Needle Bearing to *your* products. For further information write for Catalog No. 7. For

Needle Bearings to be used in heavier service, request Booklet 103X from our associate, the Bantam Bearings Corporation, South Bend, Ind.

*The Torrington Company*  
ESTABLISHED 1866  
*Torrington, Conn., U.S.A.*

Makers of Ball and Needle Bearings

New York Boston Philadelphia Detroit  
Cleveland London, England

**TORRINGTON  
NEEDLE BEARING**



were listed on page 650 of the Dec. 15 issue of **AUTOMOTIVE INDUSTRIES**.

Motor and Equipment Wholesalers Association: President, Frank G. Stewart, Standard Automotive Supply Co., Washington, D. C.; Vice-President, Henry J. Dinkmeyer, Chicago Auto Parts, Inc., Chicago; Treasurer, Harry D. Howard, Williams Hardware Co., Minneapolis, Minn.; Secretary, Thomas C. Tonkin, Casper Supply Co., Casper, Wyo. Six new directors are: Christian Olesen, Jr., The Farrar-Brown Co., Inc., Portland, Me.; Robert J. Loock, R. J. Loock & Co., Baltimore, Md.; Edward T. Ball, Jos. Strauss Co., Inc., Buffalo, N. Y.; Thomas I. Jenks, Cumings

Brothers, Flint, Mich.; Marshall L. Yantis, Ozburn, Crow & Yantis Co., Fort Smith, Ark.; C. Weir Hammond, Motor Hardware & Equipment Co., San Diego, Calif.

## Labor's Major Error

(Continued from page 2)

seeks to buy. The people want to know if and to what extent the "leadership principle," made prominent by the defense in the trial of Fritz Kuhn, applies in the handling of labor organization funds. The \$400,000 C.I.O. contribution to a political party's 1936

campaign, and the boasted raising of twice that sum for a similar purpose in the next election, give the people the undeniable right to know more than they do about where the money that the unions raise goes and why.

But more than anything else, the people want to know what is to be done to restate and further safeguard the rights of the individual and the rights of minorities, both vital to the preservation of democracy. In this respect the disclosures of the House Committee looking into the workings of the Labor Relations Act will have close study and particular attention will be given to the Act's provision for exclusive majority rule and its sanctioning of the closed shop.

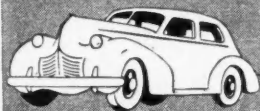
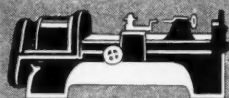
What the Act does in practical effect, with respect to the selection of bargaining agencies, is to deny to minority employees the very rights that its proclaimed pretensions were to protect. But that is only part of it, for the Labor Board, with the power vested in it by the law, can and has set majorities aside to create new and opposing ones. It can and has whimsically turned majorities into voiceless and rightless minorities. It has functioned frequently, under the law, in a manner dangerously destructive to democratic principles.

So now we and many others, including some far-seeing labor leaders, ask, with an urging that is much more than merely rhetorical, whether the National Labor Relations Act should not be amended and that right soon? After the present Congressional investigation has been concluded it seems likely, it seems almost certain, that popular demand for drastic alteration will be overwhelming.

As it stands today, the National Labor Relations Act is a most effective brake on economic recovery. Statistical records show beyond denial that the number of strikes has increased rather than decreased since the law went into effect. The bitterness of labor strife has been augmented. The National Labor Relations Act "has interfered with rather than promoted the amicable settlement of industrial disputes and the employment of duly constituted public agencies set up for that purpose; it has disrupted rather than fostered friendly relations between management and worker, with resulting discord among the employees, reduced efficiency in operation, and increased costs; it has deprived large numbers of workers of the right which the law was presumed to protect—the right to bargain collectively through representatives of their own choosing; it has fomented class distinction and class hatred; by subjecting management to new risks and uncertainties both as to rights and obligations, it has effectively prevented the expansion of existing facilities which are so essential to the economic growth and development of this country."

About what other laws could these things be said? Congress made this law. Congress can re-make it.

*The* **QUALITY**  
of a product depends upon  
the quality of its parts...



ONE tiny part — poor in quality — can spoil an otherwise perfect product. That is why the springs you choose, as simple as they may be, must match the high standard of quality of the other parts you assemble in your product. Accurate offers you those springs.

One of our proudest accomplishments is a reputation for quality. We have built it over a period of years by supplying industry with the finest springs it is possible to make. We want you to have the advantages of Accurate quality — reliability and service. Whatever your requirements may be: compression, extension and torsion springs: wire forms and stampings; let us go over them with you.

Ask for the new Accurate Handbook

**ACCURATE**  
*Springs*

**ACCURATE SPRING MANUFACTURING CO.**  
3811 W. LAKE STREET • CHICAGO, ILL.